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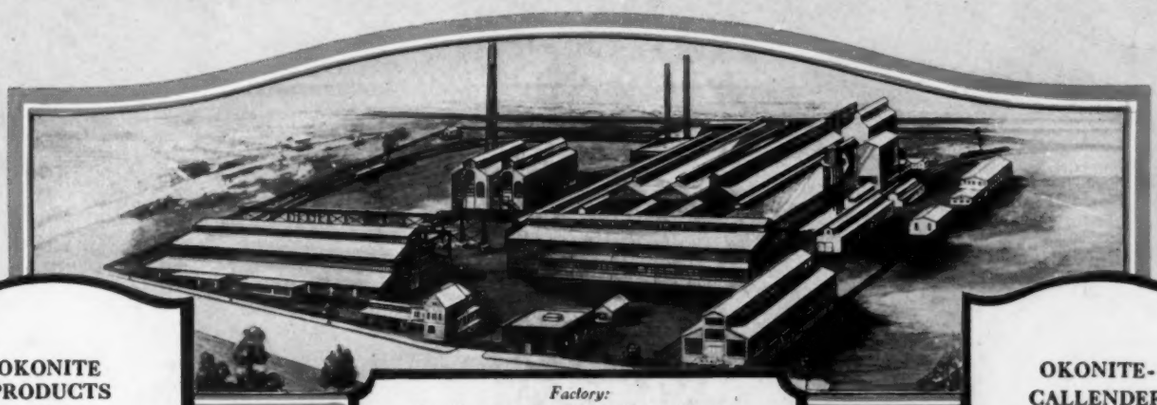

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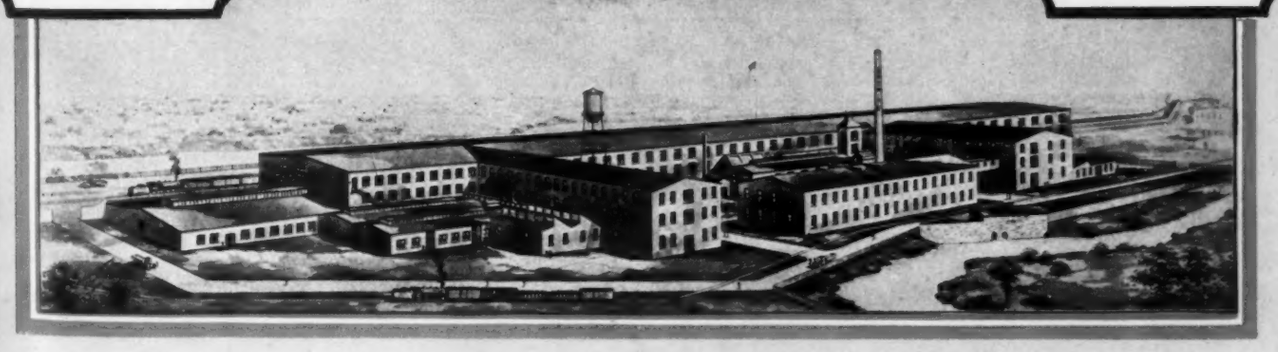

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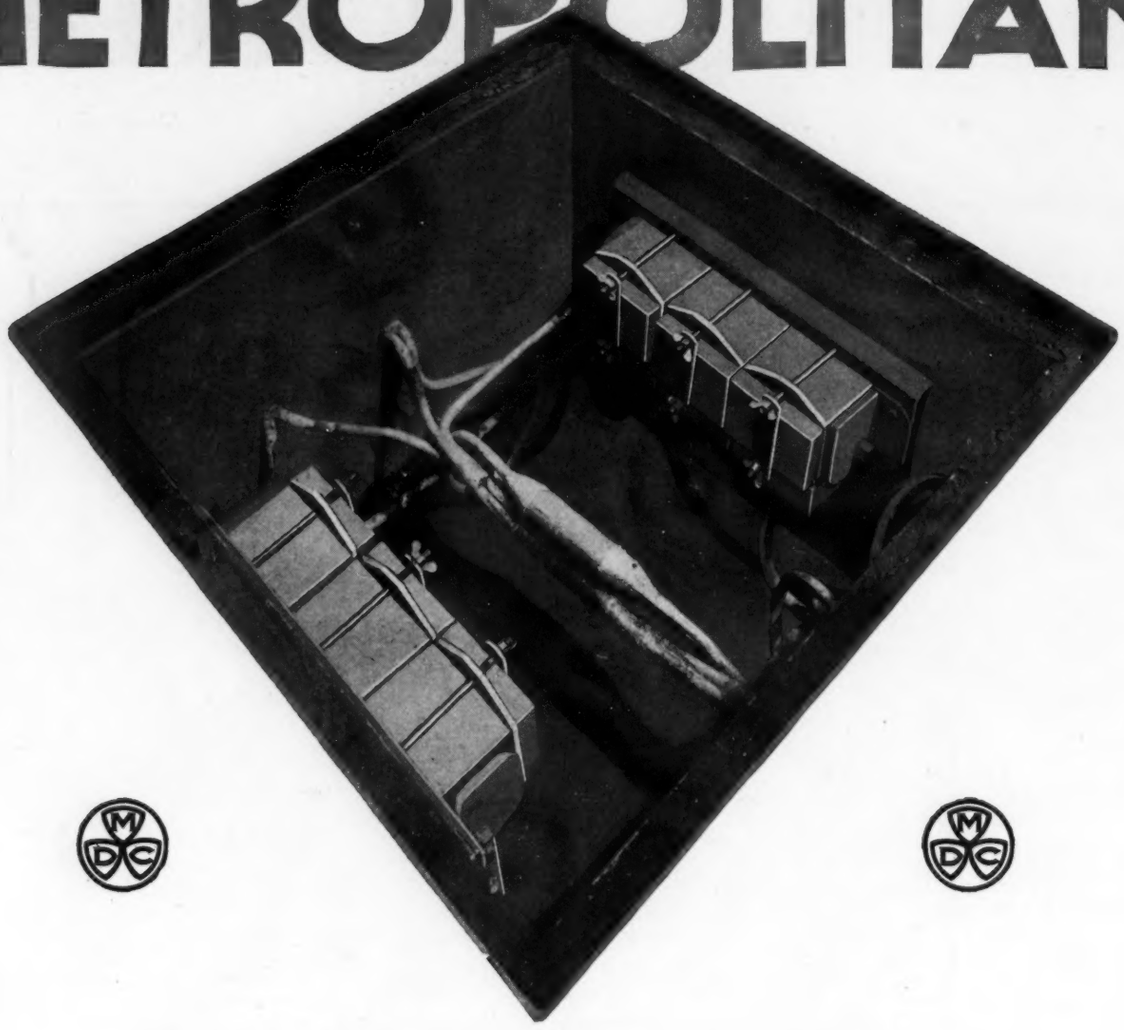

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SUBWAY SECTIONALIZING UNITS

Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 86 — *New York, Saturday, July 25, 1925* — NUMBER 4

Billions Invested in Tax-Exempt Securities

THE National Industrial Conference Board estimates that the net amount of tax-exempt issues held by investors in this country on July 1 was approximately $14,000,000,000, of which $2,750,000,000 represents Liberty bonds and securities of federal land, intermediate credit and joint stock land banks. Last year the par value of state and local securities issued was four and one-third as large as the ten-year average preceding the World War.

There are those who look askance upon this growing fund of tax-free bonds, reasoning that sooner or later industrial and commercial life must feel the effect. Under the revenue act of 1924, a tax-free bond yielding 3½ per cent pays the same return as a 6 per cent bond to one whose taxable net income ranges around $100,000. There is no doubt but that tax-exempt securities hamper in a way the freer sale of commercial paper, and yet the indications are that tax-free bonds do not have so great an effect on the sale of electric public utility investments as some people imagine. For example, during the first half of this year public utilities raised more money than during any like period in their history, and the tendency of the rate of interest is to diminish rather than to increase. Besides, our people find huge sums for foreign investments without affecting the home market. The Department of Commerce shows that America's private loans to the rest of the world total approximately $9,500,000,000, while the nation's war loans with interest represent $12,000,000,000 additional. There is thus tied up in foreign loans of all sorts and domestic government flotations the enormous sum of $36,000,000,000, showing how great the United States has become and how wealthy compared with the other inhabitants of the globe her people are.

Pinchot Tries to Make Giant Power National Issue

RETURNING to Harrisburg, Governor Pinchot of Pennsylvania made haste to extend his "giant" power campaign into every Congressional district in the United States. First he sent a copy of the report of the giant power survey in Pennsylvania to every member of Congress and with it a letter explaining his purpose to try and make giant power a national issue. His plan, he says, "undertakes to prevent the nation-wide electric monopoly now almost formed from acquiring industrial, commercial, financial, and political control of this nation. It does not aim at public ownership, but demands that in all plans for electric development the public interest shall receive consideration.

"Through effective public regulation it proposes to break down and put an end to the present unfair discrimination in rates in favor of a few great users of electricity and against moderate and small users through which the latter are made to pay extortionate charges." In other words, his plan is not to shoot, but to choke.

Would that the Governor of the Keystone State made a personal study of the matter he discusses, for then he would discover how fallacious some of his arguments are. For example, the facts as given by government statistics show that for the country as a whole operating expenses of electric light and power companies have increased more than 100 per cent in 1922 as compared with 1917. Notwithstanding that, the statistics of the Department of Labor show the cost of electricity to be less than it was before the war. The census of 1922 also reveals how far from the truth Governor Pinchot has strayed. It records that in 1917 the average rate for domestic lighting in Pennsylvania was 5.3 cents per kilowatt-hour and that in 1922 it was 4.5 cents, or 15 per cent less. And then, as if it anticipated what the Governor might say about the favored few, the same census shows that in 1917 the average rate for industrial power in Pennsylvania was 1 cent a kilowatt-hour, whereas in 1922 it was 140 per cent higher, or 2.4 cents. Of a truth, fact is stranger than fiction; but apparently Gifford Pinchot does not know it.

Make Haste Slowly Here

CHANGES in executive personnel are inevitable features of public utility life, as in all other human activities in business and industry. In a time like the present, when large numbers of properties are undergoing transfer of ownership and are entering into interconnections and regional understandings with others, there is a marked tendency for an abnormal number of company officials to leave their posts, often to be superseded by men having small acquaintance with their new territories and its people. Very frequently the new owners of a property overlook the value of long experience in local public relations, in engineering, construction and operation, and a strange manager and department heads are obliged to overcome a serious handicap in building up confidence and understanding, especially if the former executives have been summarily displaced.

It takes a long time to overcome popular resentment at the hasty removal of an official whose faithful, able and friendly service in a community covers many years and is identified with local affairs to an intimate degree. Good will suffers heavily in many cases where remote control and management by strangers succeed an ownership and management with strong local personality. Even the promise and early fulfillment of costly improvements to plant do not offset the policy of riding roughshod over the former management and staff in order to find places for outsiders or to launch immediately a program of holding company standardi-

zation which might well be introduced with some measure of tact and diplomacy.

There is another side to this question, of course. When a change in ownership takes place, it is the plain duty of the old staff to do its utmost to render the kind of service, so long as it be honorable, that the new owners desire. Inflexibility in readjustment here may be just cause for replacement, and opposition to legitimate improvements on the ground that things have always been done in some other way is indefensible. In the public utility field, however, personal relations today count for so much between executives and the public and also in their effect upon employees that gradual changes of official personnel and their responsibilities are much to be preferred to the use of the "broom." The old motto "Be sure you are right and then go ahead" applies with undiminished force to the retention, transfer and selection of executives for electric service companies in this day of rapidly shifting controls. It is poor policy to throw away the clientele good will of a competent executive where it can be retained and utilized in strengthening public relations under the new régime.

Solution of Electrical Problems by Analogs

A DISTINCT progress in the art is achieved when a new problem is reduced to one whose solution is already known. For example, flow of heat and flow of electricity in some cases follow the same general mathematical laws, and where it is easier to study the flow of electricity, the corresponding thermal problem is solved by analog. Similarly, some magnetic distributions in the active layer of electrical machinery have been investigated by studying flow of water between parallel planes. Some two-dimensional electrostatic problems have been solved by studying currents of electricity in sheet conductors, etc. The solution of a steady-state direct-current network is reduced to a set of linear algebraic equations. Conversely, a set of simultaneous algebraic equations (which may have nothing to do with electricity) can be solved by connecting up a network of resistances proportional to the coefficients in these equations and reading the resulting currents.

A recent contribution to this method of analogs is described in C. A. Nickle's paper on the "Oscillographic Solution of Electro-Mechanical Systems," presented before the last annual convention of the A.I.E.E. at Saratoga Springs. The particular problem to be solved was that of transient mechanical oscillations of a number of synchronous and induction machines, connected by transmission lines, and some provided with centrifugal governors, etc., all forming a big superpower system. With the growth of such systems, it will be increasingly urgent to be able to predict, at least approximately, what disturbance a sudden change in the load, a short circuit, or any other instantaneous change in the normal conditions will bring about.

Mr. Nickle has shown that under certain simplifying conditions the equations of hunting of the above system are identical with those of a stationary "model" circuit consisting of laboratory resistances, inductances and condensers. By subjecting this model circuit to a sudden change of conditions and determining the resulting transient currents and voltages oscillographically, one thereby solves the simultaneous differential equations of hunting of the big system. The practical importance of this procedure cannot be overestimated and we confidently look forward to further uses of this method in application to large projected superpower and interconnected electric systems.

Utility Company's Advisory Function in Stimulating Ornamental Lighting

ALTHOUGH many utility companies are in favor of financing ordinary street-lighting installations and provide for the overhead expenses in the rates charged for operation and maintenance, few favor the financing of ornamental or "white-way" installations because the divergent and rapidly changing opinions on the right type call for frequent changes. Such lighting systems are usually left to be financed by the property owners or the city, the company providing the circuits and equipment up to the lamp post and including in its charges for operation and maintenance the overhead expenses on the investment made. When handled in this manner such installations usually constitute desirable business as they represent larger loads per foot of circuit. To stimulate such business central-station companies can exert an influence in working out and suggesting methods of financing which are logical and equitable.

"White-way" or ornamental lighting, while having all the advantages of ordinary street lighting, such as reducing the hazards to vehicular and pedestrian traffic, lessening crime, etc., has a definite and striking benefit to the property owners, especially if there are business places along the "white way." Light has always attracted moths and human beings have the same characteristic. An attractively and brightly lighted street invites strollers—both walkers and riders—and arrests the attention of transient visitors without their knowing the cause. The light conveys the impression of life. Travelers, indeed, have been known to avoid staying over night in poorly lighted towns and to be led to remain in well-lighted ones against their first intention. These facts bring crowds into brightly lighted districts which might otherwise be nearly or quite deserted after nightfall. The light makes more conspicuous the buildings along the street and even partly produces the effect of show-window lighting. Coupled with artistic and sufficiently varied show-window lighting, "white-way" lighting has an advertising value to business houses along such streets.

Since the property owners directly or indirectly benefit by the lighting, there is equity in the argument that they should pay for the lighting, or at least for the expense over and above the cost of ordinary illumination where this is supported by general taxation. One of the ways in which this principle has been applied in most cities is to assess the abutting property owners for the cost of the "white-way" fixtures and excess operating expenses above the normal street-lighting expense. Another way is for the abutting property owners to install jointly their own lighting standard served from regular street-lighting circuits. The danger in the latter case is that one group of property owners will want and install one kind of fixture, and another group another kind, making a hodge-podge mess of incongruous standards on the same or

intersecting streets. Some kind of supervision by the city is necessary to prevent inharmonious installations. Possibly this can be done by allowing a selection between a few harmonious fixtures on different streets but insisting on the same kind on any one street. What these designs shall be can be determined in consultation with the property owners, but the city's right to harmonious, dignified fixtures is paramount.

Any advisory part which utility companies can fill in suggesting types of fixtures and methods of financing will go a long way toward building up the ornamental lighting in business sections and stimulate corresponding improvement in the show-window and interior lighting of business places abutting on the improved district.

New Types of Oscillographs

THE development of radio transmission served as a great incentive to the study of alternating frequencies in the extreme upper ranges. The frequencies involved in telephonic transmission provided a similar stimulus for studies at the opposite end of the frequency scale, both these extremes, however, lying above and well outside the ordinary commercial range of power frequency. As a consequence the whole question of frequency throughout the entire range of its occurrence in electric circuits has been receiving constant attention from physicists and research engineers. Naturally one of the most important phases of this field of work is the question of graphical record as a means of studying amplitude, phase relation, wave form and the like. The range of frequency in oscillographs is limited by the natural frequency of the vibrating system. Consequently the Dudell instrument, which has proved so extremely valuable for the ordinary circuits of power utilization, has a somewhat limited range, say up to 2,000 or 3,000 cycles.

Many other types of oscillograph have been proposed and efforts are being continually made to provide a satisfactory instrument for the upper range. One or two recent studies in this direction are of interest. An article by A. Perot in a recent number of the *Revue Générale de L'Électricité* describes an instrument in which a moving picture film placed on the periphery of a wheel is made to move with a velocity of 150 m. per second. The current whose frequency is to be measured passes through a coil which contains a cell of any liquid in which will rotate the plane of polarization of light. A spot of light from a powerful arc lamp, which is plane polarized before entering the cell, is focused on the film. The high-frequency current rotates the plane of polarization and by a suitable lens system the trace on the film reproduces variations of the high-frequency current. Records are shown of oscillations up to 100,000 cycles or more. Another effort due to C. E. Wynn-Williams, in a recent number of the *Philosophical Magazine*, attempts to use the piezo-electric effect of crystals. The electric field is applied to a crystal suitably cut and the expansion and contraction of the crystal is used for operating a recording mechanism. Such an instrument has the advantage that it works on a difference of potential only, and suffers the disadvantage that the natural frequencies of the crystals so far investigated are relatively low, say of the order of a few thousand cycles per second.

The cathode-ray oscillograph has long been known and appears to offer greatest promise for investigations of the character mentioned. Difficulties with this instrument are not with the inertia of the moving system, but that of the mechanism for recording a phenomenon which is varying with the time and in an irregular manner. A very noteworthy announcement has just been made by W. Rogowski in the *Archiv für Elektrotechnik* to the effect that this type of instrument has now been developed in such a way as to overcome the difficulty mentioned. He shows records of the reflection of traveling waves from the end of an open line and claims that these are the first waves of this character ever recorded. The records indicate variations in the shape of the pulse which have an estimated time interval of a hundred-millionth of a second. Moreover, they indicate that these traveling rectangular pulses have extremely steep wave fronts and rears, apparently suffering little or no damping in passing down the line and on reflection. This has been a much discussed question, as regards its influence on the danger to terminal apparatus. The author gives no complete description of the instrument, but ventures that it has opened a new era in the investigation and knowledge of transmission line transients. He promises more complete information and some data in a later paper. In view of his standing and of his prediction, it will be awaited with very great interest.

By Their Works, Not Their Words

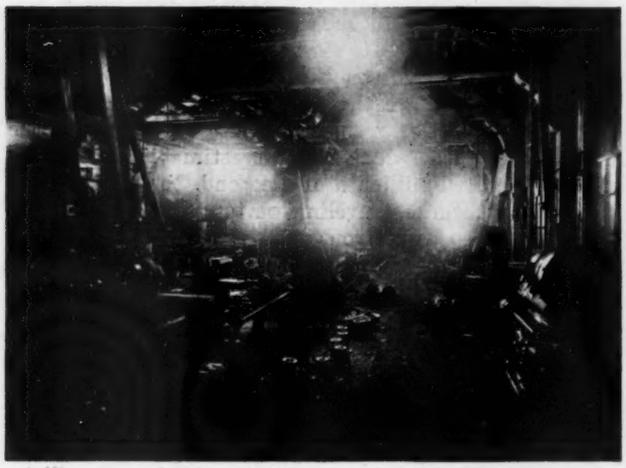
SOME opponents and proponents of private ownership of utilities conduct themselves as do two small boys arguing about the relative accomplishments of their fathers as pugilists. Very often there is a plethora of words associated with a paucity of ideas and actions. That conviction or constructive performance results is very doubtful, for boisterous argument is usually a preventive of calm analysis or logical debate.

The very fact that men differ on this question and that both private and public ownership exist is evidence that there are two sides to the question and that an analysis of facts and experiences is the only safe approach to a truthful conclusion. The ink-and-word-spreading propagandist of public ownership does his case harm, as does the same type of private ownership propagandist. Neither converts thinking people, and the reciprocal mud-slinging contest into which this kind of dispute often degenerates excites either amusement or disgust in most people and draws into the muck of mutual abuse only those who take the same pleasure in mud baths.

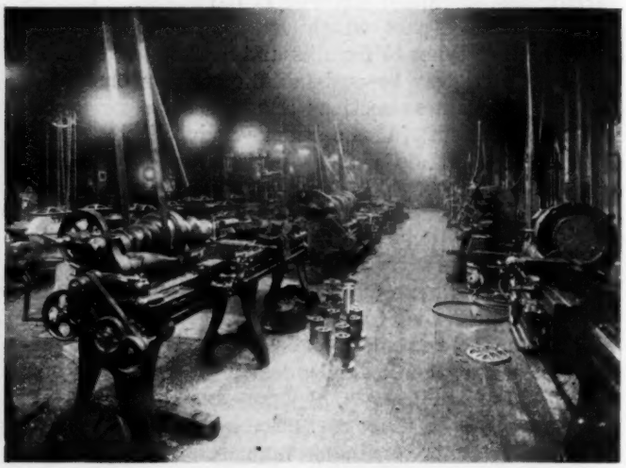
This big question should be decided upon the basis of the facts and experiences that abound, and not by mere assertion of opinion. A few muzzles on loud-voiced evangelists would enable the facts to be heard more readily by the thinking public. Actual data and experience in this and other countries are available for use, and the presentation of these in a truthful and simple way will show that private ownership of American electric light and power companies bestows upon the American people greater benefits from electricity than they can attain by public possession and operation. It is not a subject that needs the accompaniment of jazz bands to attract an audience, nor does it lend itself to the uses of the demagogue or propagandist who desires to hypnotize his audience for his own selfish purposes.

Industrial Lighting Campaign in Boston

Good Light in Industry Is an Economic Asset and Reacts Very Favorably on Social and Health Conditions—The National Campaign for Better Industrial Lighting Should Be Supported Wholeheartedly by the Electrical Industry



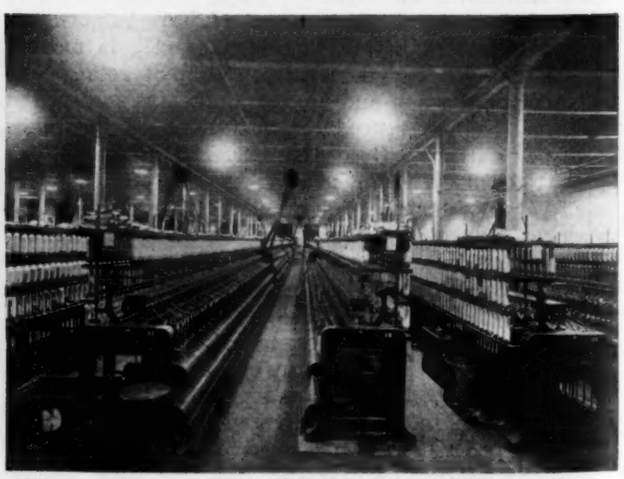
The Machine Shop of the Coffin Valve Company Averaged 2.5 Ft.-Candles Before Modernization



After Lighting with 150-Watt Lamps in RLM Reflectors There Was an Illumination of 12 Ft.-Candles

The Offices of Samuel Cabot, Inc., Had Originally 4 Ft.-Candles

After Modernization, Using 300-Watt Lamps, an Illumination of 10 Ft.-Candles Was Had



The Beaming Room of the Boston Manufacturing Company Was Changed from 1 Ft.-Candle to 9 Ft.-Candles

High-Speed Elevator Developments

Experience Data Indicate Important Advantages of Alternating-Current Equipment—Economy, Safety, Reliability and Smooth Operation Achieved—No Line Disturbances Are Noticeable

By E. B. THURSTON
Electrical Engineer Haughton Elevator & Machine Company, Toledo, Ohio

UNTIL quite recently the high-speed electric passenger elevators of large metropolitan buildings were always driven by direct-current motors. In many of the larger cities direct current is generally available for these large installations, but in smaller cities and in areas outside the direct-current district of large cities the expense of supplying direct current for elevator service is very great. Furthermore, many of the larger cities are now reducing their direct-current districts and are extending alternating-current feeders into the heart of the direct-current areas. The greater economy of alternating-current distribution is well known, and perhaps the principal deterrent to further replacement of direct current in these congested areas has been the opinion that only direct current was satisfactory for high-speed elevators found in these districts. In the light of these conditions, the three-year record of four high-speed elevators using alternating current will be of interest.

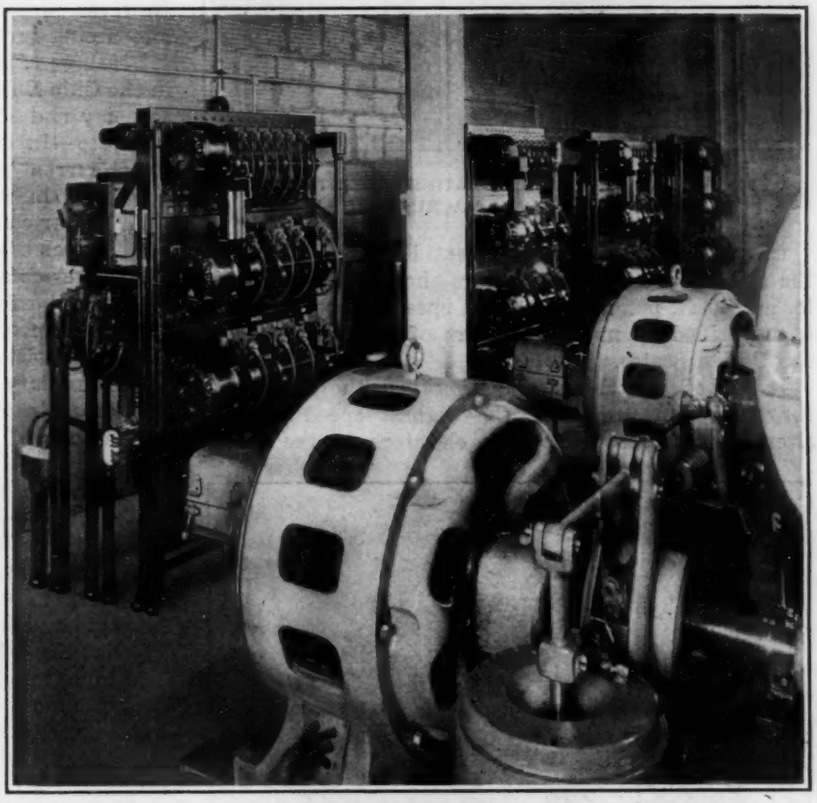


FIG. 2—FOUR HIGH-SPEED ALTERNATING-CURRENT ELEVATORS IN OHIO BUILDING, TOLEDO, OHIO

Three years ago the management of the Ohio Building, Toledo, Ohio, found it advisable to replace four plunger hydraulic type elevators because there was a demand for better and more rapid service and because the cost of operation and maintenance of the hydraulic elevators was becoming prohibitive. The Ohio Building is approximately 100 ft. square and has twelve active floors. The building is located in the heart of the direct-current district and direct-current elevators would have been installed had not officials of the power company and the architects for the building learned of the new developments in alternating-current elevators. Their investigation convinced them that alternating-current elevators offered advantages to both the user and the light and power company supplying the energy that could not be passed by. The power company extended its alternating-current feeder into the Ohio Building, making available to the entire building the lower rates for primary power. This was the first step in effecting economy with alternating-current elevators: lower distribution costs to the company supplying the energy, and lower power cost to users.

In the original hydraulic elevator installation the average car speed was 450 ft. per minute. It was felt that this speed was too low.

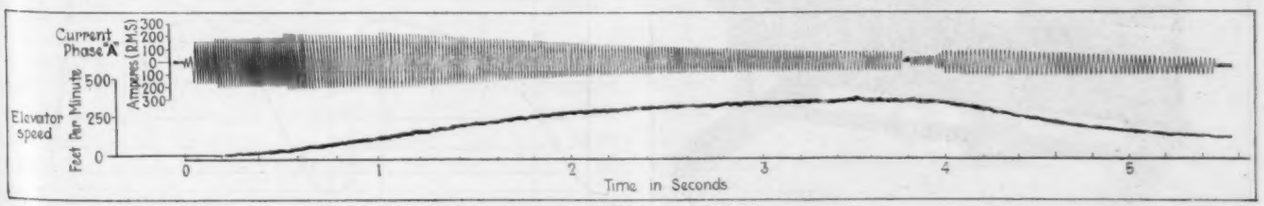


FIG. 1—OSCILLOGRAM SHOWING AMPERES IN ONE PHASE OF AN ELEVATOR MOTOR. THE ACCELERATING STEPS OF THE CONTROLLER MAY BE SEEN ON THE CURRENT OSCILLOGRAM. THE SOLID LINE REPRESENTS CAR SPEED IN FEET PER MINUTE

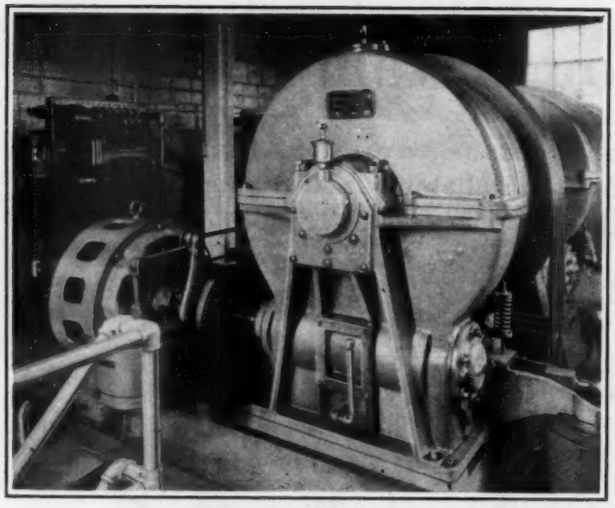


FIG. 3—NEAR VIEW OF ALTERNATING-CURRENT MOTOR AND ELEVATOR MACHINE

In selecting the new equipment it was decided that the alternating-current elevators should be rated 2,500 lb. at 540 ft. per minute. This speed in operation has been verified by many engineers of different parts of the United States.

It is believed this installation had the distinction for some time of being the highest speed straight alternating-current passenger elevators in the world.

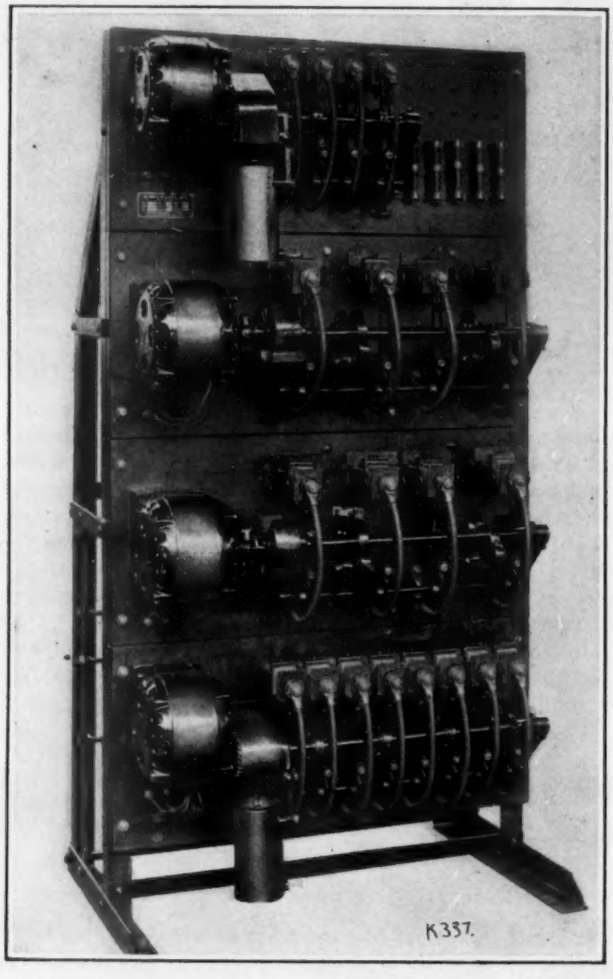


FIG. 4—CONTROL PANEL FOR HIGH-SPEED ALTERNATING-CURRENT ELEVATOR SHOWING POWER-OPERATED CONTACTS

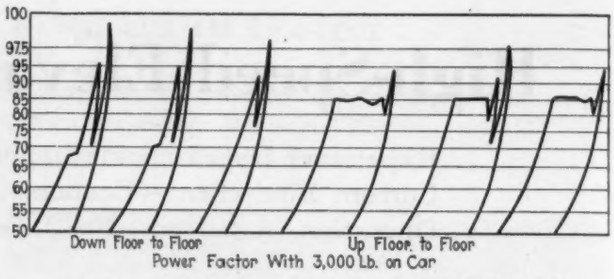


FIG. 5—POWER FACTOR OF ELEVATOR MOTOR DURING COMPLETE DUTY CYCLES

However, there are now installations of the straight alternating-current equipment using a higher car speed.

Features of alternating-current elevators as installed in the Ohio Building may be stated as safety, reliability, economy and smoothness of operation.

Safety—In addition to the usual safety features of direct-current elevators the following safety provisions are found in this alternating-current installation:

All power contacts are locked open in off position.

All power contacts are opened by hammer action.

If power contacts fail to open in the regular manner, they may be forced open by power.

On failure of power, the entire equipment resets to the stop position, irrespective of load.

No auxiliary contacts required in control circuit to protect against failure of power.

Operation of two independent control circuits by the car control switch prevents loss of control of elevator car in case of short circuits.

Inherent protection against phase reversal or phase failure is provided without use of auxiliary relays. When car control switch is moved from full speed to stop position, both motor and magnet brake act together for rapid and smooth deceleration and stop.

Reliability—An essential to reliability is the reduction to a minimum in the number of parts. These alternating-current elevators have eliminated commutators, slip rings (multi-speed squirrel-cage motors being used) and all sliding contacts. The controllers have only four power magnets and one brake relay with a total of only twenty-two interchangeable power contacts and three brake contacts. Of the total of eighty-eight power contacts on the four elevators, none has ever been cleaned, adjusted or sanded and only two were replaced after twenty-two months of service. After more than three years of service, three of the machines have given more than 10,000 miles each and made more than 2,000,000 stops each, while the fourth elevator giving night, Sunday and holiday service shows more than 18,000 miles with more than 3,000,000 stops. This machine still has its original brake liners and hoist cables. In the entire installation of four elevators, having a total of eighty-eight duplicate controller con-

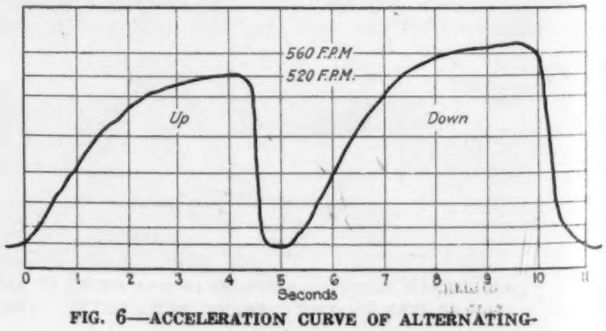


FIG. 6—ACCELERATION CURVE OF ALTERNATING-CURRENT ELEVATOR

tacts, there are more than 78 per cent of the original contacts still in service.

Shut-downs due to the machines, motors, controllers and brakes during the time of service show an average of 1¼ shut-downs per elevator per year with a total shut-down period of twenty-one minutes per elevator per year.

Economy—In addition to the economy effected by using alternating-current supply in place of direct current, the elevators in the Ohio Building have a record of total operating cost, including fixed charges as well as power consumption and maintenance, that compares most favorably with any installations that have been investigated.

Smoothness of Operation—Contrary to popular belief, the alternating-current elevators can operate as smoothly as the average direct-current machine. The alternating-current machine does not cause an objectionable line disturbance, as it operates with a power factor of 85 per cent while starting and over 74 per cent when lifting load. The change in current values with the change in car speed is not severe, as is indicated in the accompanying oscillogram. The regenerative action of alternating-current elevators may be utilized in effecting smooth deceleration, as shown by a test of a 28-hp. motor lowering a rated load on a 425 ft. per minute elevator when it returned 6.7 hp. to the line.

Byllesby Executive on Timely Subjects

Better Understanding of Utilities by Both Public and Commissions—Reward for Good Management—Purchase Price of Companies—Danger of Boom—Financial Considerations—Strength of Customer Ownership

An Interview with
JOHN J. O'BRIEN
Byllesby Engineering & Management Corporation

SINCERE appreciation of the increased consideration of utility problems by both the public and the commissions that has become manifest since the war, and of the change in public opinion on the question of political versus commercial ownership, was expressed by John J. O'Brien, president of the Byllesby Engineering & Management Corporation in a recent interview with a representative of the ELECTRICAL WORLD. "During the war," he pointed out, "small and large industries alike were hard hit by limited and infrequent coal deliveries and turned to the utilities for service. Fortunately, the federal administration was broad-minded enough to recognize the more economic use of coal in utility power plants and the possible reduction of railroad congestion to be gained by shipping coal chiefly to utilities, and therefore the latter received priorities. When it was explained to regulatory bodies and the public that a utility must be allowed adequate rates to attract capital with which to furnish service, the justice of the claim was recognized, and both have been more considerate ever since of the relation of service to rates."

JOHN J. O'BRIEN

Asked what further consideration commissions could give the utilities to help the public, Mr. O'Brien suggested that if some plan to reward good management such as exists in Massachusetts and in Dallas, Tex., could be more generally applied the public would be the ultimate beneficiary. "As it is," Mr. O'Brien pointed out, "indifferent management is allowed just as high a rate of return as an efficiently conducted utility. A company which is not so considerate of the public in its daily point of contacts as is another company gets the same rate. Conversely, an economically managed firm whose employees are courteous in every word and action gets no reward over the opposite type of company. Nevertheless, progressive utility companies are doing what they can for the public without thought of a premium over and above what is considered a fair rate of return.

"Reward for good management and service might induce the less considerate companies to follow the example of the more altruistic ones. In Dallas the city allows the utility 8 per cent return on capital used and useful in public service plus one-half of any excess earnable, the remainder going to the city. In Illinois the utilities are rated on service and management, but no reward is offered."

The tendency of some "shoestring" brokers to take advantage of the improved standing of utilities by buying up properties and selling them at a pyramided price

to companies which need the systems to bring the benefits of interconnection to the public was brought to Mr. O'Brien's attention. He said on this point: "While the Byllesby company has not purchased any plants or systems to fit into broad interconnection projects at excessive prices, some companies have evidently felt forced to do so because properties which are essential to their plans were held by brokers. Rather than submit to hold-up methods, the Byllesby company will refuse to pay the pyramided prices, knowing that when the day of reckoning comes rates will be based upon physical valuation solely, although unregulated business enterprises are valued on their earning power.

"While utility securities are in high favor now," continued Mr. O'Brien, "it is unfortunate that there should have been such a boom, because the public may think that utility securities are earning fabulous returns, whereas they have only attained a standing which should have been accorded them before if their firm foundation had been more generally recognized. The increased market value does not indicate that the possible return has been greatly increased, but that a fair return has been more nearly assured.

"Despite the public favor of utility stocks and bonds, the tax-free bonds of municipalities, states and federal government are still an impediment to raising money at low rates, though not to as large an extent as formerly. While it can be shown that the public would be benefited by eliminating tax-free bonds," explained Mr. O'Brien, "it is unfortunate that a high court decision dating back as far as 1890 declares that taxes cannot be imposed on municipal bonds."

Ratio of Stocks to Bonds

In this executive's opinion, a healthy utility condition requires a ratio of sixty to forty for stocks and bonds respectively, with even a higher percentage in stocks if obtainable. "With the opportunity of bonding a property for only 65 per cent of its value, and the necessity of selling these bonds at 92 per cent of par, very little advantage is secured by utilities in the cost of capital by issuing bonds," Mr. O'Brien contends. "With the recent enlightenment of the public regarding utilities and the small investors' opportunity to get a satisfactory return on utility stocks with a pronounced degree of safety, it is not difficult to secure even a higher ratio of stocks to bonds.

"Despite some experiences and apprehensions, there should be no fear among utility companies which have distributed their securities properly among the public that all their work will be undone by a rise in the market value causing the holders to sell. This may happen if large blocks of stock are sold to individuals, but is very unlikely with small holders. As a rule the small holder will retain the securities as an investment and not use them for speculation like large holders do. Hence the widespread public interest in the utility will be retained. There may be times when a small holder will be hard pressed for money or need it for building a home, but such holders can be educated to the advantage of securing a loan on their utility securities rather than selling them. The security dividend will more than pay the interest on the loan and leave the principal intact.

Benefits of Customer Ownership

"Through customer ownership of securities agitation for political ownership (of which considerable was heard at one time) has been largely overcome," Mr. O'Brien optimistically asserted. "Municipal plants are being taken over every day and converted to private operation. Whereas at one time a disgruntled customer might find a sympathetic listener when he complained, and the two would spread the dissatisfaction, this does not happen now because of the better understanding. When rates had to be raised in one community recently, for instance, one customer said to his neighbor, 'Isn't it an imposition that this electric light company is raising rates?' Much to the surprise of the complainant, his neighbor replied, 'No, *we* found the company was really entitled to the increase.' 'Whom do you mean by *we*?' the complainant asked. 'Oh! Didn't you know that your friends Jones and Smith and Brown and thirty thousand other people in this city are stockholders in the company?' Furthermore, this stockholder explained why the increase was justified and didn't let the question go unanswered as it might have gone before the days of extensive customer ownership."

Rural Rates in Sweden

IN 1924 THE Swedish government appointed a royal committee to investigate the electrical rates charged by government and private rural distribution companies with a view to making recommendations of rate changes which would lead to a wider use of electricity. Both the government and private companies in most cases delivered the power at 3,000 volts to tertiary stations, from which private organizations distributed it through the local district.

The average rates at the tertiary stations per kilowatt-hour were found to be as follows: Board of Waterfalls, 1923, 3.6 cents; South Swedish Power Company, 1923, 3.5 cents; Gullspang Munkfors Power Company, 1924, 3.55 cents. The cost to the consumers was much higher and varied according to the cost of the local system, the local system losses and the density of population. In south Sweden, the most densely populated area, the cost of power on the farm ranged from 6.7 cents to 8 cents per kilowatt-hour and in some cases to 8.75 cents. In central Sweden, where there are many wooded areas and the distribution lines are longer, the power costs ranged from 12.1 cents to 13.5 cents per kilowatt-hour. In the north of Sweden a flat rate per horsepower and lamp is charged, but the cost is about 25 per cent more than in central Sweden, as given above.

As a result of the investigation the Royal Board of Waterfalls has established a new rate schedule set up in the following way:

1. A fixed yearly charge of 68.5 cents per unit—the unit being the basis of repartition organization among its members and corresponding to the hectare (2.47 acres) of farm land or two lamps.

2. A demand charge of $94.36 per kilowatt per year for power below a certain subtraction limit, decided by the distribution organization, and corresponding mainly to no-load losses.

3. An energy charge of 1.8 cents per kilowatt-hour for energy above the subtraction limit, kilowatt-hour meters being used which register only energy delivered when the power exceeds the subtraction limit.

It is believed that this rate schedule will meet the power requirements and economic possibilities of the rural distribution organizations and will encourage a much greater use of electrical energy than would be possible with higher rates.

Hybrid Lighting Systems Questionable

More Economical Operation Obtained by Using Series and Multiple Lamps on Circuits for Which They Are Designed—Comparison of Performance of Both Types Given

OPERATION of series incandescent lamps from multiple circuits by the use of auto transformers is of questionable value, according to O. F. Haas, National Lamp Works, in discussing modern street lighting at the Duluth convention of the North Central Geographic Division, N.E.L.A., July 15 to 17. Lamp manufacturers, he pointed out, have investigated this form of operation for many applications and invariably an analysis of the results has shown that straight multiple lamps operated on multiple circuits are more economical and give more satisfactory performance than any of the series-lamp-auto-transformer combinations that have been used.

The distinction between street-series Mazda lamps and multiple Mazda lamps is that multiple lamps are designed for operation on circuits regulated for voltage, whereas street-series lamps are designed for operation on circuits regulated for current. This, in brief, means that the filament cross-sectional area of all sizes of street-series lamps is made as accurately as possible to a given current rating, while the filament lengths of multiple lamps are made in all sizes to a given voltage rating. It is obvious, therefore, that with the series lamps the unavoidable variations of manufacture are made to appear as variations in the voltage rating in order to maintain constancy of current rating.

FILAMENTS FOR SERIES LAMPS

For a given lumen output and life, the larger series lamps can be made somewhat more efficient by employing short, stocky filaments designed for high current (15 and 20 amp.), even though the losses through the supports are increased. This is due primarily to the fact that at a given temperature the cross-sectional area of a small filament is reduced by evaporation proportionately more rapidly than is that of a large one. For a given life, the larger filament can therefore be operated at a higher temperature, which means a more efficient generation of light.

On the other hand, the larger cross-sectional area filaments used in the higher amperage lamps do not give as good a maintained lumen output throughout life as do the 6.6-amp. lamps. When a 6.6-amp. series lamp is burned on a series circuit, the bulb becomes increasingly discolored and the cross-sectional area of the filament is constantly decreased, due to the evaporation or disintegration of the filament. The current, however, remains at its initial value and causes an increased brilliancy per unit of surface because of the increased filament resistance and consequent increased wattage, sufficient to counteract the bulb discoloration entirely. These lamps, therefore, maintain their average lumen output at 100 per cent or better of initial throughout their rated life. The 20-amp. lamps, however, have a volume of filament materially greater than the 6.6-amp. lamp, and consequently bulb discoloration is a more serious factor. These lamps in the 10,000-lumen, 20-amp. class, according to the manufacturer's rating, have an average lumen output throughout their rated life of 92 per cent when burned on a circuit in which the full 20 amp. is maintained to the end of life.

CONDITIONS ON MULTIPLE CIRCUITS

With lamps operated on multiple circuits, a different condition obtains. As the lamp burns the filament evaporates, thus becoming smaller in cross-sectional area, the same as with the series lamp; however, since the multiple lamps are supplied from constant voltage circuits, as the filament resistance increases the current through the filament decreases, thus causing a decrease in lumen output. On the other hand, the filament in a multiple 115-volt lamp of comparable size to the 10,000-lumen, 20-amp. series lamp is much smaller in volume, and consequently bulb discoloration is not as important an item. In fact, taking into consideration both bulb discoloration and reduction in current, the 500-watt, 115-volt multiple lamp has a rated maintained average lumen output of 90 per cent.

It is apparent that the burning of high-current series lamps on a constant-voltage circuit combines those factors which tend toward poor lumen output maintenance on the series lamp when burned on the series circuit and on the multiple lamp when burned on the multiple circuit—that is, maximum bulb discoloration and decrease in current through the filament as the lamp ages. Obviously, therefore, the series lamp burned on the multiple circuit would not be expected to be so good a lamp as either of the two others. The National Lamp Works and Edison Lamp Works engineers estimate from calculations that the average 10,000-lumen, 20-amp. lamp when burned on a multiple circuit will give approximately a mean of only 80 per cent lumens throughout life and a final value of not more than 60 per cent.

ADVOCATES MULTIPLE LAMPS ON MULTIPLE CIRCUITS

The practice of burning series lamps on multiple circuits is not a new one. When the Mazda C lamp was first brought out, such a system was advocated by some for interior lighting, especially in large buildings such as foundries, steel mills, etc. However, such practice was discontinued as soon as an analysis of the results obtained was investigated. It is the lamp engineers' sincere opinion that much more satisfactory results will be obtained by burning straight-multiple lamps on multiple circuits. The facts that have led to this conclusion are as follows:

1. Variation in Voltage of Individual Series Lamps—(a) It is inherently impracticable to make short, thick filaments such as the 20-amp. as accurate for voltage as the 115-volt lamps. (b) As series lamps are designed for constant current, the unavoidable variations of manufacture are made to appear as variations in the voltage rather than in the current. Depending upon the extent of variation, individual lamp life and output may be seriously affected.

2. Future Changes in Efficiency.—Series lamps are rated in lumens at various amperages, so changes in efficiency mean corresponding changes in lamp voltage. It is quite possible that large central stations would learn of these changes, even though the changes were not radical, and could make adjustments on the auto-transformers to take care of the situation if enough allowance in the design were made. However, it is not believed that in general the small user would know the trouble. A parallel case is that of the series circuit, which requires a constant-potential transformer with various taps and small reactance coils at each lamp. The lamp companies have continuously had trouble calls, even up to the last few years, where the more efficient gas-filled lamps were substituted for the vacuum type without a corresponding change on the transformer taps.

3. Simplified Construction—The elimination of the individual auto-transformers will result in a simplified construction, higher power factor and a lower first cost. It is true that the auto-transformer with several taps allows a convenient method of correcting for voltage drop. However, the places where such an adjustment is necessary are rare, and especially where installed by an engineer not entirely familiar with the equipment probably would not be worked out entirely satisfactorily. The voltage drop could be taken care of as it is in house feeders—that is, with a somewhat larger wire or, in the few cases where it is necessary, by a one-to-one ratio transformer.

COMPARISON BETWEEN 500-WATT MULTIPLE LAMP AND 10,000-LUMEN, 20-AMP. SERIES LAMP

Lamp	Multiple	Series
Rated lumens	9,400	10,900
Average lumens	8,460	8,000
Rated watts	500	518
Average watts	492	510
Burning period per year, hours	4,000	4,000
Efficiency of auto-transformer in per cent	....	0.95
Total watts	492	536
Average life, hours	1,000	2,160
Cost of lamps (40 per cent discount, 4,000-hour year)	4.80	4.12
Cost of power, $0.01½ per kw.-hr.	29.52	32.16
Labor cost of renewing lamps ($0.50 per trim)	2.00	0.93
Fixed charge on auto-transformer (20 per cent)	....	1.90
Comparative summary	36.32	39.11
Annual cost per 10,000 lumens, average	42.80	48.90

4. Lamp Substitution—While the series lamps burned on series circuits are in general more efficient than the multiple lamps, this difference is slight, especially when the transformer loss is considered, and does not apply to series lamps burned on multiple circuits. For example, the 115-volt, 500-watt lamp (9,400 lumens initial) gives a higher mean lumen output throughout life than does the 10,000-lumen, 20-amp. lamp burned on a multiple circuit, even though the latter consumes materially more wattage. The substitution of wattage rated lamps for lumen or candle-power rated lamps, while a problem, does not seem at all impossible of solution. It has already been met in Minneapolis with the lamps of 200-watt size and below. In general, changes in street lighting are made only at the time the contract expires, when there is no difficulty in making new contracts on a wattage basis, even though the multiple lamps do not correspond exactly in size with the series.

5. Operating Cost—An analysis of cost shows that the multiple lamps can be operated more economically for equivalent light output than can the series on the multiple circuits. This is because of the elimination of the auto-transformers, the better sustained lumen output and the fact that even though the life of the multiple unit is shorter, it has a materially lower first cost. The accompanying table indicates the annual saving in cost in favor of the 500-watt multiple lamp in comparison with the 10,000-lumen, 20-amp. series lamp.

6. Failure to Supply Rated Lumens—Possibly the most serious consideration entering into the use of series lamps on multiple circuits is the failure of individual lamps to supply even approximately the rated lumens on which the contract is made. Even though large central stations might be able to word their contracts in such a manner that they would not be held liable if the city retained an illuminating engineer to investigate contract fulfillment, it is very doubtful if the smaller central stations not familiar with all the factors would be in as fortunate a position. This is no idle consideration, as there are a number of central stations that have already felt the sting of not fulfilling street-lighting contracts.

PERFORMANCE OF SERIES AND MULTIPLE UNITS

Calculated and measured data on the performance of certain lamps follow: 10,000-lumen, 20-amp. lamp burned on series circuit, rated average life 1,350 hours, average lumen output 92 per cent; 500-watt lamp burned on multiple circuit, rated average life 1,000 hours, average lumen output 90 per cent; 10,000-lumen, 20-amp. lamp burned on multiple circuit, calculated average life 2,160 hours, average lumen output 80 per cent. This means that the average lamp, so burned, would go down to approximately 60 per cent of initial lumen output before burnout. Some lamps would be better and some worse. In general, lamps that lived longer would have a lower average lumen output and shorter-lived lamps would have a higher lumen output.

It is to be expected that the life in operating service would be somewhat longer than the theoretical values given, since, in general, lamps have a factor of safety built into them, and further, the voltage drop in the lamp circuits would give a longer life, but at further reduced lumen output.

To check these calculated data, five series lamps (10,000-lumen, 20-amp.) and five multiple (500-watt) lamps were taken from the regular quality tests. While the results with just the few lamps involved could not be expected to check the preceding average calculated data exactly they are highly indicative. The data for the 10,000-lumen, 20-amp. lamps on the multiple circuits were obtained from the tests on this group of lamps when operated on a series circuit with corrections for constant voltage made for all readings at the periods at which the lamps were photometered. The results follow: 10,000-lumen, 20-amp. lamps burned on series circuit, average life of five lamps, 1,680 hours; average lumen ouput throughout life 95 per cent; 500-watt lamp burned on multiple circuit, average life of five lamps, 1,250 hours, average lumen output 92.5 per cent; 10,000-lumen, 20-amp. lamps burned on multiple circuit, average life of five lamps, 2,950 hours; average lumen output throughout life 83 per cent.

The preceding facts lead, in the opinion of lamp engineers, inescapably to the following conclusion: The customer obtains more satisfactory service and the central station obtains a more economical system and more ethically fulfills its contract if series and multiple lamps are burned only in the circuits for which they are inherently designed.

Economic System Operation*

How the Brooklyn Edison Company Operates Three Stations to Make the Yearly Costs a Minimum—Scheduling of Units, Checks of Operation and Handling of Reserves Outlined

By E. C. M. STAHL
Operating Department, Brooklyn Edison Company

THE Brooklyn Edison system consists of three generating stations, the Hudson Avenue station of 150,000 kw. present installed capacity, the Sixty-sixth Street station of 65,000 kw. capacity, both 60-cycle stations, and the Gold Street station, a 25-cycle station of 125,000 kw. capacity, giving a total of 340,000 kw. capacity. These three generating stations transmit power to twenty-three substations throughout the city and to about forty-five high-tension customers who buy power direct. The 25-cycle and 60-cycle systems are connected through a 35,000-kw. frequency changer, which in effect means there is only one system from a generating standpoint.

The primary problem of generation is one of analyzing the cost of generation in the three stations and assigning loads and load factors to them so that the over-all cost of producing the yearly demand will be minimum with due regard for continuity of service and the necessary outages for overhauling.

As a result of these studies the expected yearly load factor at Hudson Avenue will be 47 per cent, at Gold Street 35 per cent and at Sixty-sixth Street 10 per cent, figures that will at once indicate that Hudson Avenue is the base load station and will be operated as such.

In order to provide absolutely continuous service from the stations, it is the policy always to have sufficient generating capacity in operation so that in the case of the loss of the largest unit the other units in operation will be able to pick up the entire system load. This principle is carried right through to the boiler room and essential auxiliaries, and it is also used in the substations. In addition to being a safe operating rule, it safeguards the supply of power to customers, which in turn creates their good will. It also permits the company during the greater part of the twenty-four hours to operate close to the point of best over-all economy of the units in service, particularly during the heavy load periods. The third and a very important condition is that it is not necessary to carry what is usually called an emergency unit. This latter condition is reflected in the matter of being able to maintain all apparatus in better physical condition, which in turn results in lower costs and increased scheduling equipment.

Carefully prepared schedules for all conditions of load and availability of equipment in the various generating stations have been prepared for the normal guidance of the system operators to direct the actual division of load between the stations and the stopping and starting of all main units. In addition to these system schedules, each generating station is furnished with a carefully developed set of schedules for directing the operation of all equipment at various loads and combination of generators.

Enough boilers must be available to meet the steam demands at all times. This means carrying more than are necessary over the periods of light loads, with the consequent losses due to banking. At the Hudson Avenue station it takes about fifteen tons of coal to bring up a boiler from a low bank and get it on the line. In order to prevent this loss the boilers are operated during the day at about 125 per cent rating and are pushed up over the peak. When the automatic combustion control system is put in service, operation should be more efficient over a wide range of boiler ratings and save much of the loss now due to banking.

In taking up detailed operation of the Hudson Avenue station the most direct manner will be to follow the various cycles through the station. The incoming coal may be hoisted at the rate of 500 tons per hour, using both towers. The control of these towers is by a Ward-Leonard system, which gives ease and flexibility of both operation and control. These towers possess still another advantage in that the movement of all levers is the same as the steam towers at Gold Street and Sixty-sixth Street. The complete cycle of the three-ton bucket

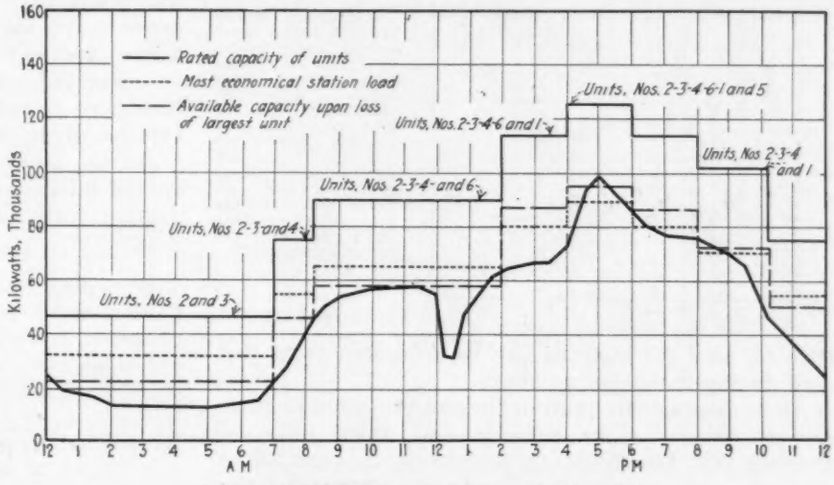


FIG. 1—AMOUNT OF SPARE CAPACITY FIXED

The curve of the Gold Street station load for Dec. 7, 1922, is a definite illustration of the Brooklyn Edison operating policy with regard to spare capacity. The typical load curve is readily distinguishable and the step curves are self-explanatory from the key that is given on the chart.

*Abstract of a paper presented before the New York Section of the American Society of Mechanical Engineers, Jan. 21, 1925.

is guaranteed at thirty seconds, but in actual operation this time has been reduced to twenty seconds, or coal has been hoisted at the rate of 450 tons per hour with a single tower.

The weight of the incoming coal is automatically recorded in passing over the track scales of the coal road before it is dumped into the bunkers. It might also be added that in passing through the crusher hopper in the coal tower a continuous sample of coal is automatically taken for fuel analysis. An additional check of the storage coal at any time may be had by estimating the bunker contents. From the bunkers coal is delivered to the individual boilers by means of weigh lorries, which also keep a record of the coal delivered to each boiler. The rate of coal feed is further recorded on the Bailey meter attached to each boiler and a cycle counter is used on the stoker shaft. In this way a very accurate check is kept on the coal fed to each boiler. By a method adopted in filling the hoppers the coal that is to be used for banking can be separated from that used during the steaming hours.

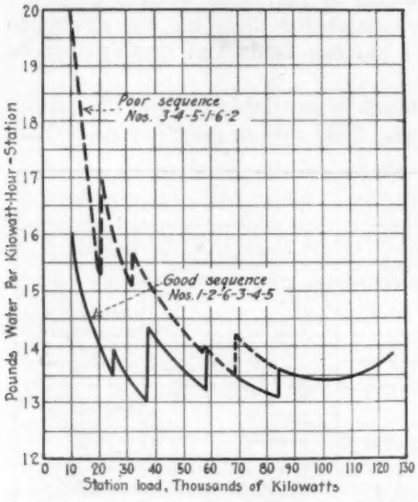


FIG 2—SECURING ECONOMICAL WATER RATE

The chart, showing combined generator water rates, is typical of studies that have been made to determine the most economical sequence of putting turbines on the line to follow daily load curves either when all units are available or when certain units are out of commission.

After passing through the furnace the ash and clinkers are broken up by motor-driven clinker rolls and dropped into the hydraulic sluiceway, through which they are carried out to the ash pit. Representative samples of ash are gathered from each boiler and also from the ash pit for analysis.

Efficient Control of Combustion

Each boiler is equipped with an individual boiler panel designed to give the attendants complete information as to the momentary condition of the fires and combustion and to record daily performance.

The Bailey meters are set so that at all ratings the red and blue pencils should be together with about 30 per cent excess air, which gives approximately 14 per cent CO_2, corresponding to the proper combustion conditions. At the present time the stokers are operated entirely by the stokermen, only the forced draft being regulated by hand from the combustion control room.

In order to correct combustion conditions and incidentally to create a friendly spirit of rivalry, the stoker attendants on the three watches are given a rating based on the success with which they keep the red and blue lines together. These ratings are posted on the bulletin board and on noting the consistent improvement in rating made by one of the stokermen, which went from 90 to 95 and then to 100 per cent, one of the boilermen remarked to the stokerman, "Tomorrow you make 105."

Another very good feature that has developed in holding the stokermen to their good chart records is that as soon as one of them feels that his record is not what it should be he is very diligent in trying to discover the cause, and particularly if he thinks it is instrument trouble he will not be backward in asking to have the instruments checked and calibrated.

It is surprising how quickly the men learn the proper control of combustion by means of the Bailey meters and how soon they acquire the knack of manipulating the large fuel beds of 350 sq.ft. When centralized combustion control is put into operation, either manual or automatic, the stoker attendant will still have his individual panel to operate by and can modify the conditions of each boiler to give exactly the right conditions.

The three primary requisites in the boiler room are cleanliness of the heating surface, proper regulation of the fuel bed, and maintenance of the stokers. The efficiency of the boiler depends upon these three. It therefore becomes the problem of the operating supervisors of the station to study how these can be accomplished with a minimum of change-over of boilers. This problem becomes all the more acute at Hudson Avenue when it is realized that twenty-five tons of coal is lost in taking one boiler off the line and bringing a cold boiler in. The boiler control room is laid out in order to provide a centralized control for each group of boilers and in turn for the control of all four groups. In order to accomplish this, automatic load indicators have been provided for each group of eight boilers and for the whole station. The basic means of control is to set the group stoker speed to correspond to the load on the number of boilers in operation and adjust the draft to maintain steam pressure.

Heat Balance Checking

Recording instruments have been inserted in the heat balance cycle of operation so that proper temperatures, pressures and quantities are available at any instant for operating purposes or for the computation of the heat balance by watches or for the twenty-four hours. Data in the form of curves and tabulations have been worked up to show the proper readings of all of these indicating and recording instruments under various conditions of station load and combinations of units. All that is necessary in order to see that equipment is operating properly and efficiently is to check the instrument readings against the computed readings, and if there is any variation, either it is corrected by proper manipulation or else the cause for the variation is ascertained and proper action taken.

In addition to the recording instruments five rather large log sheets are kept at the station, on which all of the important operating conditions are recorded half-hourly and hourly, so that the major conditions are always available for reference from the log sheets, and each morning a meeting of the operating supervisors is held to analyze the major results of the previous day's run.

In addition to the regular operating crew a group of men is maintained at the station known as the "station betterment" crew. The duties of this group are to maintain and calibrate instruments, check the recording charts and compute very detailed reports on the operation of each boiler for each watch, the station heat balance for each watch and the performance of each unit.

In order to assist in the computations, curves have been developed that not only materially reduce the labor

involved in obtaining the required values but permit the results to be obtained very soon after the records have been sent to the office.

The starting and stopping of the turbo-generator is carried out by a very simple and direct system of signals between the high-tension gallery and the turbine room. The high-tension operator begins the procedure by lighting the dome light over the turbine to be started; lights the signal "Start" on the panels and then blows one blast of the whistle. With the exception of the whistle all signals are in duplicate for answering back. After checking preliminary conditions, the watch engineer quickly opens the throttle far enough to start the unit turning, at the same time noting the inlet pressure at the start. The throttle is closed as soon as the turbine rolls over and then is allowed to roll under its own momentum. After a period of five minutes the throttle is again opened sufficiently to maintain a speed of about 200 r.p.m. for thirty minutes, or, in other words, until the turbine has become evenly heated. After this the unit is gradually brought up to speed, using about thirty minutes or more, or one hour for the complete operation.

The watch engineer signals "Field" to the high-tension operator and the field is put on the machine shortly after the unit is started. A rotary air pump is used in starting and then after the unit is on the line the steam jet air pump is put in and the rotary pump is shut down. The steam jet air pump requires less attention than the rotary pump, is more reliable and requires less maintenance. It is, however, not well adapted to starting a unit, because it requires cooling water; this is obtained by circulating the condensate from the main unit through the cooling coils.

When the unit is up to "speed" the watch engineer signals "Speed" to the high-tension operator and the operator then proceeds to synchronize the unit. As soon as the unit is on the line the high-tension operator puts out all signals lights and gives one blast of the whistle.

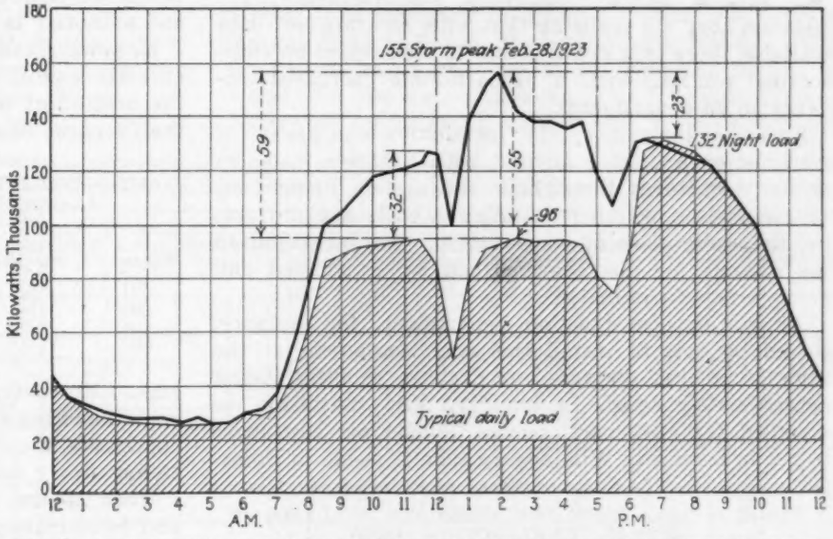


FIG. 3—AN UNUSUAL OPERATING EMERGENCY SHOWN BY THE SYSTEM LOAD CURVE

One of the unusual occurrences for which the operating department of a central station must always be prepared was the dense fog that shrouded New York on Feb. 28, 1923. The effect of this on the Brooklyn Edison system load is clearly illustrated on the accompanying chart. The cross-hatched area represents the typical load that was to have been expected for this day, and the heavy line shows the actual load that was supplied. This condition, lasting for an entire day, was most unusual and the storm peak was excessive. One of the remarkable features was that the afternoon load exceeded the evening peak by 23,000 kw. at the time of the year when the evening peak was ordinarily much higher than the usual day load.

OPERATION OF AUXILIARIES

The following is a general outline of the operation of the auxiliaries: All of the 2,300-volt motor-driven auxiliaries have push button starting control and are thrown directly on the bus.

(a) Both circulating pumps are kept running when a unit is in service, so that if one fails the vacuum will not be lost.

(b) During cold weather or when the river water is cold the pumps are operated at low speed, as this gives sufficient vacuum and makes an appreciable saving in auxiliary power. When the temperature of the river becomes such that the increased vacuum which additional circulating water will give is worth more than the extra cost of pumping this water, the circulating pumps are run at high speed.

(c) In order properly to protect the boilers one turbine-driven boiler-feed pump is kept warmed up and turning over slowly at all times, so that if one of the electrically driven pumps fails it can be brought up to speed as quickly as the throttle can be opened.

(d) The river water is so dirty that it is necessary to clean the condensers two or three times a week. Whenever a unit is shut down rubber plugs are forced through the tubes with compressed air. As the condensers are too large to clean all the tubes in one night, (there are more than 13,000 tubes in each of the 70,000 sq.ft. condensers), about one-third of them are cleaned at a time. A record is kept of the tubes cleaned each night, so that the same ones will not be cleaned the next night. During each cleaning the condenser is tested for leakage and any leaky tubes are plugged.

With the exception of the steam-driven house turbine to provide for a source of power for the auxiliaries of the station, all the power sources are located in the electrical building. The house transformers, which are normally used to feed the auxiliary buses, and the frequency changer, which is tied to Gold Street, supply the 2,300-volt power. All of the auxiliaries requiring more than 50 hp. are driven directly from these buses. The 440-volt transformers are located in the switch house and supply buses for taking care of auxiliaries of less than 50 hp.

The four-unit motor-generator sets used as a supply of direct current for the boiler auxiliary sets are on the auxiliary floor of the switch house; so also are the motor-generator sets that supply 125-volt d.c. power for all control circuits and valve motor operation. The central point for operating all of these auxiliary supply transformers and rotating units is the low-tension control room, in which lies most of the responsibility for the continuous operation of all the power station auxiliaries.

The high-tension gallery is the center of control not only for the main turbo-generators and the outgoing 27,000-volt feeders but for the frequency of the entire system, both 60-cycle and 25-cycle. The guiding instrument for the control of frequency over a long period of time is the Warren master clock.

Analyzing Utility Construction Costs

Method Employed by Duquesne Light Company in Establishing Detailed Cost System Covering Substations, Metering, Overhead Lines, Underground Cable Installation and Street Lighting

By P. O'MOORE
Formerly Cost Engineer Duquesne Light Company, Pittsburgh, Pa.

UTILITY companies have begun to realize that cost finding is just as important to their organizations as to commercial manufacturers; for instance, they are realizing that with accurate cost data available there is a great saving in time spent on engineering routine, with a proportionate increased efficiency in all departments.

Accurate analysis of the installation charges on a construction project compared with analyses made on similar structures throughout the system brings out by comparison whether installation costs are uniform for the same class of construction. By investigation the reasons for discrepancies can be determined and in most cases eliminated.

An efficient construction department, for instance, should be able to install the same equipment at the same labor cost, distance and drayage problems being approximately equal. A standard loop substation, as installed for customers' service, should not cost more to put in service in Wilkinsburg than it would in Homewood, Oakland or East Liberty. The service connection may vary in each case, but the actual cost of the substation itself should approximate the same figure. Let us see what happens to a company lacking an efficient construction system. Suppose a 22,000-volt automatic duplicate substation, overhead lines with outdoor transformer bank, is taken as an example. This is one of the several type substations for delivering service to customers.

TABLE I—DATA FORM FOR ADEQUATE ANALYSIS OF ACTUAL CONSTRUCTION COSTS

CONSTRUCTION ORDER NO. 4234. JOHN DOE COMPANY OPENED 4/5/24. CLOSED 7/1/24.

Description	Date	Quantity	Equipment	Labor	Salaries	Freight Hauling	Wire Cable	Insulators	Bldg. Mt'l	Iron & Steel	Misc. Mt'l	Expense	Capital Retired	Total
a/c 241				17.50	62.00	22.00						1.50		
300-Amp.		3	51.00	10.00										
220-Volt.														
Disconnecting Switches.														
4½-in. wrought-iron pipe		62 ft.	56.90				4.90 6.00							

Assume that the prospective customer has requested service. The engineering department checks up on his requirements and with due regard to system operation recommends the type of station. A preliminary estimate on the total construction cost is submitted to the commercial department; and if the annual revenue warrants the initial investment, the contract is signed and agreement made whereby a portion of this initial cost is borne by the customer. The final plans are then made and the installation is estimated from the completed layout; materials and equipment are bought and authority is given to proceed with the work.

If, however, the utility company has no actual records of costs readily available for correct estimation, then the best effort of a trained engineer is nothing better than a guess based on his more or less practical experience. Moreover, it must be admitted that most engineers handling such routine work lack the construction experience necessary to teach them the difference between theory and practice.

TABLE II—PERCENTAGE OF TOTAL EQUIPMENT AND MATERIALS AGAINST INSTALLATION COSTS BY ACCOUNTS

Account	Labor, Per Cent	Engineering, Per Cent	Expense, Per Cent	Freight and Hauling, Per Cent
241	25	5.	1.0	4.5
242	26	2.5	0.4	10.0
243	14	3.5	0.7	4.0
256	28	3.0	0.5	8.0
257	19	4.0	0.8	4.5

Then if the preliminary estimate calls for $9,000 and is recommended by the commercial department as a good investment at that cost, and the final estimate calls for $12,000, still based on guesswork and the individual engineer's experience, and the actual cost shows on the auditor's records at $15,000, a minimum figure for such an installation as referred to, then the company is placed at a distinct disadvantage and must either go before the customer and ask for a readjustment, refuse the service as unprofitable, thereby repudiating the contract made, or stand the loss by living up to the contract and giving service that does not warrant the investment and maintenance. As earnings are dependent on profitable connections to customers, the importance of accurate cost data becomes apparent.

Again, if the project is underestimated, additional authority is necessary before the deficiency can be met and before the auditor will allow the charges. This entails reports, investigations and much extra work

TABLE III—SECONDARY RACK UNIT FOR 110/220-VOLT SERVICE STANDARD DRAWING NO. D-101

Account No.	Class No.	Description	No. Reqd.	Unit Cost	Total Cost
256	27741	Secondary rack	1	$0.64	$0.64
	429653	Through bolt ⅝x16 in.	1	.10	.10
	4221374	Lag screws ½x5 in.	1	.03	.03
		Total			$0.77
		Installation cost			.50
					$1.27
257	221615	Spool insulators	3	.08	.024
		Total			$0.24

NOTE: Installation cost of Account No. 257 is included in Installation Cost of Wire given in Wire Data Table. Sheet No. 82.

and time loss, besides discrediting a perfectly good and competent engineer. A skilled mechanic cannot turn out good work without the tools to work with.

Another important use of cost data is in connection with budget control of expenditures for extensions, improvements and replacements on the system. With a definite appropriation available for these purposes, executives must have confidence that the estimates of cost of projects submitted to them are accurate and that the contemplated program of work will be completed within the appropriation.

An example of the methods followed in establishing a cost system designed to serve the various purposes referred to above may be found in the system recently created by the writer and installed in the engineering department of the Duquesne Light Company at Pittsburgh, Pa., the principal features of which are described below.

When the creation of a cost data system was authorized the establishment of two fundamental principles seemed necessary before actual work was started:

1. To sell the organization as a whole the idea of cost data, that all interested might be made to realize that cost accounting is a helpful service rather than a compilation of critical statistics; and that the accuracy of the system would be dependent upon their co-operation.

2. To centralize all cost data available in the records of the company before deciding on its ultimate compilation, system of handling, and method of application.

Next it was necessary to decide what part of construction should be first analyzed. Activities were confined to electrical construction as applicable to customers' connections, accurate costs along those lines being of vital importance to both commercial and engineering departments. To arrive at these costs it was necessary to set up the following systems:

1. Creation of a filing system covering electrical equipment and materials. The cost needed was not to be the present-day cost of individual items, but the actual cost to the company of all equipment and materials plus storeroom charges. There again was the problem of rapid fluctuation in prices, covering numerous groups of material and equipment. To overcome this the closest co-operation of manufacturers was obtained in setting up a system whereby actual present-day prices plus the manufacturers' forecast of percentage of increased or decreased cost covering a period of three months in advance was available. Using a price based on this system, enough money was assured in any individual estimate to cover purchase of materials specified, irrespective of the fact that the order may not be placed until weeks after the estimate is approved. If prices drop in the meantime, that much additional leeway is added to the estimate. One junior is competent to handle the file once it is compiled, extend it and keep it up to date.

2. Creation of a system whereby proper analysis of the actual charges against individual construction orders can be made. The auditor's records are kept in conformity with a "Uniform Classification of Accounts" as authorized by the Public Service Commission. This allows for the necessary segregation of charges required; it is necessary to create a system whereby the charges could be taken off the auditor's books so as to require the minimum time in applying the figures so derived to cost data purposes. The following system, illustrated in Table I, was decided upon, which not only allows for an adequate analysis of actual construction costs but at the same time is directly applicable for valuation cost compilation.

CONSTRUCTION ORDERS ANALYSED DURING 1925 *Month of*_____

C.O. NO.	DATE ISSUED	WORK STARTED	C.O. CLOSED	TOTALS BY ACCT. ESTIMATED	TOTALS BY ACCT. ACTUAL	ACCT. NO.	MATERIAL ESTIMATED	MATERIAL ACTUAL	LABOR ESTIMATED	LABOR ACTUAL	LABOR E%	LABOR A%	FREIGHT & DRAYAGE ESTIMATED	FREIGHT & DRAYAGE ACTUAL	FREIGHT & DRAYAGE E%	FREIGHT & DRAYAGE A%	ENGINEERING ESTIMATED	ENGINEERING ACTUAL	ENGINEERING E%	ENGINEERING A%	EXPENSE ESTIMATED	EXPENSE ACTUAL	EXPENSE E%	EXPENSE A%	CONTINGENCIES ESTIMATED	CONTINGENCIES ACTUAL	CONTINGENCIES E%	CONTINGENCIES A%
ESTIMATED COST PRELIMINARY	FINAL	ACTUAL COST	%OVER OR UNDER EXP.																									
LOCATION																												
NATURE OF WORK																												
				TOTAL BY ITEMS																								

BY HAVING THREE OF ABOVE FORMS ON A SINGLE SHEET CONSTRUCTION ORDERS MAY BE EASILY ANALYZED

Under "Description" in Table I the account number is given. Under this account number can be itemized in any detail all material and equipment covered by the account number. The subdivisions to the right of the column headed "Description" allow for the proper segregation of the various charges against any individual account number.

It is necessary to state here that what we are interested in obtaining from this analysis is the percentage of installation costs against total equipment and material costs as segregated by the "Uniform Classification of Accounts" for electric companies. From figures taken off in the manner above described the following analysis is possible:

ANALYSIS OF COMPANY ORDERS

Estimated $27,414. Closed on auditor's records, $26,397.81. Unexpended 3.7 per cent. The percentages of total equipment and materials against installation costs by accounts is given in Table II.

3. It was next necessary to create a system whereby

TABLE IV—SUMMARY COST DATA FOR 22-KV. SUBSTATION

Page Serial No.	Description	Total Installation	Acct. No.	Material	Acct. No.	Engineer	Acct. No.	Labor
100	22-kv. auto. line panel overhead lines.....	$2,977	241	$2,840	241	$425	241	$700
101	22-kv. auto. line panel underground cable...	3,745	241	2,575	241	400	241	665
105	22-kv. trans. panel indoor transformer bank	385	241	270	241	40	241	65

all engineers and estimators would be kept up to date on cost data, this system to be as simple as possible and to be such that complete review would be unnecessary more than twice a year. Also the data must be in such shape as to be readily applicable, and to entail only nominal expense in its compilation and upkeep. The system decided on is as follows:

All "Standards of Design" covering construction applying to "Customer Installations" were taken and detail "Bills of Material" taken off covering each individual standard. The cost of materials was next figured from the cost filing system already referred to and totaled, and an estimated cost of installation added. These costs were further segregated under their respective account numbers as given in Table III.

From these detail cost data sheets were next compiled summary data sheets, classified under their individual headings as: Substation 22 kv., substation 4 kv., metering, overhead lines, underground construction, cable installation and street lighting. The summary data sheets were compiled as shown in Table IV to render the utmost assistance to the estimator in the preparation of his estimate.

The above summaries were again taken, and standard substations were estimated complete with total cost installed, showing plan, elevation and one line diagrams for electrical installations. There are adequate plans of suitable building structures to house same, covering both steel and brick buildings, complete with approximate cost and minimum dimensions. However, costs covering wire, poles, drayage, manhole construction and duct structures were treated on a unit basis, and underground costs segregated into wet and dry areas, inside and outside Pittsburgh territory, on account of drayage and labor problems. Other complexities too numerous to be dealt with in one article continually cropped up, but were satisfactorily handled.

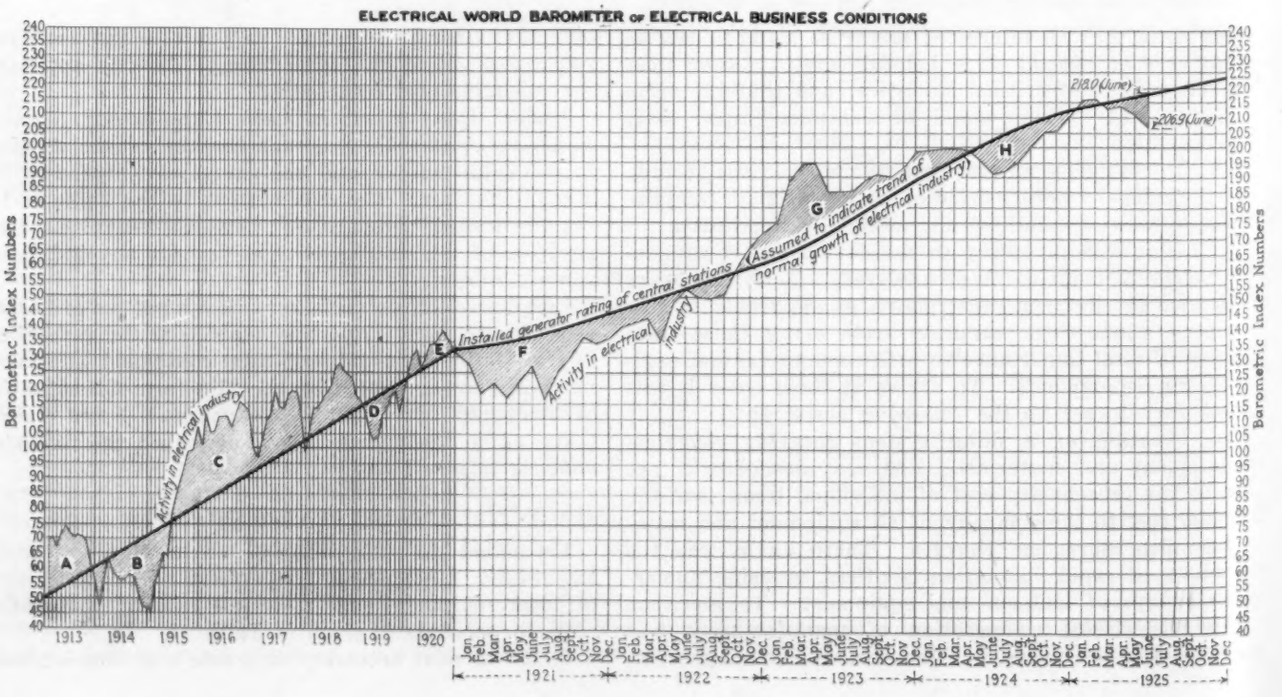
Estimators and engineers are supplied with individual summary cost data books. In each section or department two master files are supplied, listing the summarized data in detail to which the page serial number column to the extreme left of the specimen summary data sheet shown in Table IV has reference. As standards change, new prints are sent out to replace obsolete or inaccurate data, and as costs fluctuate new figures are issued to all persons holding books and the necessary corrections are made. Finally, as fast as new installations are completed, analyses are made by a comparison of actual cost percentages against estimated percentages, so that we are enabled to fix our installation costs with fair accuracy. All such analyses are compiled on the form shown in the illustration on page 169.

By classifying the individual installations, according to the nature of the work, the Duquesne Light Company has been able to show where construction costs are high, which allows for a check-up and possible future remedy.

June Operations Under Those of May

PRODUCTION figures upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" is based indicate that June witnessed a further decrease in the activity of the industry. Practically all the primary industries which are considered as barometric of general industrial activity, and those used as the basis for activity in the electrical industry, were operating at several per cent below the estimated normal during June. This subnormal industrial activity is reflected in the activities of the electric light and power branch of the industry, which incomplete returns indicate was operating at 8.8 per cent below the estimated normal during June.

During June the electrical industry as a whole was operating at 11.1 per cent below the estimated normal for the month. In May it was operating at 6.6 per cent (revised) and in April 2.9 per cent below normal.



Letters from Our Readers

Albert Edward Winchester—An Appreciation

To the Editor of the ELECTRICAL WORLD:

There was laid to rest the afternoon of July 3 one of God's noblemen—one of those brave hearts who fought the battle of life as the Divine Creator intended he should fight it, and won. In Albert Edward Winchester there was inoculated a sublimity of purpose rarely possessed by mankind in general, a frank, ingenuous honesty, an unerring adherence and devotion to what he believed to be right, a sympathetic heart that spontaneously responded to the cause of the afflicted, an unsurpassed example of one who always radiated sunshine whilst he himself was suffering untold agony from an apparently incurable physical affliction.

To those who had the privilege of his friendship the life and character of Albert E. Winchester will be a shining light as long as life lasts, an example of sterling honesty, devotion to duty, and love for his fellow men that is well worthy of emulation. Never did he allow commercialism to submerge the finer qualities of a true man, a devoted husband and father, nor those of a steadfast friend. To the industry with which he had so long been associated he gave of his best intellectually and physically, and his passing will mark a void it will indeed be difficult to fill. For sincere altruism, for steadfast optimism in the face of apparently insurmountable obstacles he had no peer, and the industrial and social world with which he was connected will keenly feel the passing of Albert Edward Winchester.

F. A. WARDLAW,
Secretary Edison Pioneers.

Placing the Brackets in the Home

To the Editor of the ELECTRICAL WORLD:

Lighting brackets for wall mounting should be considered under two separate heads, each of which has its own application. The first head may be termed "utilitarian," and used to include those wall brackets for illuminating the kitchen sink and mirrors in the bathroom and perhaps the bedrooms. This class of luminaire is used for local illumination only. To prevent glare the lamps should be well shaded by glassware which closes inward at the bottom instead of flaring outward. The use of these wall brackets is not so difficult if the center of the lamp be kept about 3 ft. above the sink or lavatory and, when two are used, about 5 ft. apart if space permits.

The second class of wall brackets may come under the head of "ornamental," and be used in the dining-room living-room, and perhaps bedroom. This luminaire should not be depended upon for illumination. Its light is only for the artistic effects produced. Its objects are to produce "atmosphere," accent some object in the room, or to produce some harmony of arrangement or color. The use of this luminaire is very difficult and should not be attempted unless the design has included furniture, wall decorations, system of illumination, etc.

Wall brackets should not be used for general illumination, as glare is sure to result if sufficient illumination is obtained. Even though the lamp be shaded from direct view the bright spot on the wall behind it will produce the glare effect. Provision for ornamental lighting can be made most flexible by the use of wall receptacles suitably located for portable candlesticks, table and floor lamps.

The writer believes that the above could well be used as a guide for the public and the electric fraternity to the benefit of both.

D. W. BLAKESLEE,
Illuminating Engineer.
Pittsburgh, Pa.

Licensing Bill Passed in Illinois

A BILL for the licensing of master electricians (mentioned in ELECTRICAL WORLD, March 7, 1925) has been signed by the Governor of Illinois. The new law governs the installation of conductors and equipment for the utilization of electricity for light and power and requires that any one doing electrical work by contract must register with the city in which the work is done.

The qualifications needed for a license include two years' experience in regular work and knowledge of construction practice in the particular municipality. The law provides that any municipality where a department of inspection is operated must have an electrical commission. This commission may make its own rules and regulations. In communities where no inspection departments are operated, all work shall be done in accordance with the National Electrical Code.

The law provides that the local electrical commission shall consist of: A commissioner of gas and electricity, an electrical contractor, an electrician, a representative of the fire underwriters and a representative of the local central-station company. It is believed by those sponsoring the new law that licensing by a commission, constituted as indicated above, will remove this supervision from political influence and will prevent local inspectors from making changes in regulations without a hearing before the commission. The new law should reduce the cost to contractors of securing duplicate licenses in various communities, because no payment need be made for a license in any community in which the fee is less than in the municipality in which the contractor already possesses a license.

Water Power in Jugoslavia

OFFICIAL estimates recently issued give the total hydro-electric power available in Jugoslavia as 3,056,000 hp. Of this total only 136,000 hp. has been developed, but the government has since the war given most serious consideration to the best methods of using the remainder. On one river alone, the Drau, there is said to be 400,000 potential horsepower. Stations are now projected in the industrial regions along the coast in the neighborhood of the city of Spalato which will total 196,000 hp.

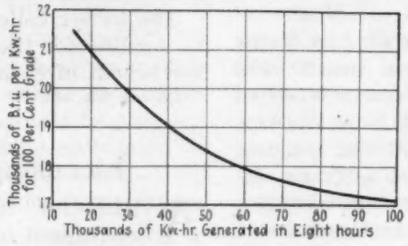
Stephan Szavits, one of the most noted electrical engineers in the country, estimates that approximately 750,000 hp. would be made available along the Danube by the building of a 100-ft. dam which is necessary in any event to complete the regulation of the river. This power would be available where it is in the greatest demand, in the rich industrial provinces of Bosnia and Herzegovina.

Central Station and Industrial Practice

An Urge to Securing High Plant Economy

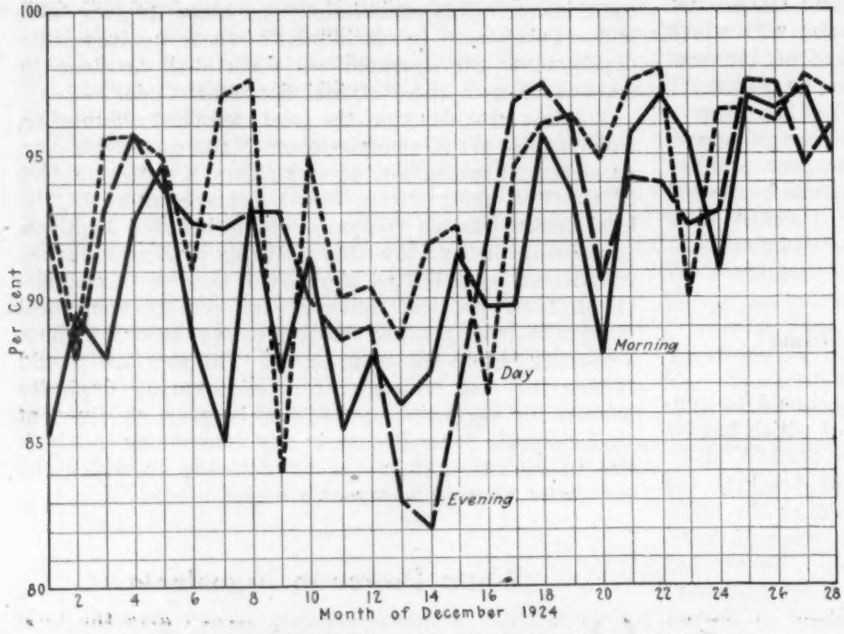
BONUS systems of various kinds have been tried to stimulate power plant operators to secure the highest plant economy consistent with operating conditions, but very few have been reported successful, due apparently to the inability to devise any system that will equitably recompense each individual or bring about high fuel economy without increasing maintenance expenses.

At the Tulsa generating station of the Oklahoma Power Company very good results have been obtained by a system that has advantages over a bonus system. However, instead of paying a bonus to individuals and running the chance of not dividing the bonus in proportion to the amount which each contributes to the final result, competition is stimulated among shifts by merely posting the results obtained on a large blackboard in the boiler room.



BASIS FOR ESTABLISHING BOGEY

The blackboard is divided horizontally into three columns for the night, day and early evening shifts and vertically into spaces for the kilowatt-hours, output, gallons of oil consumed, kilowatt-hours per gallon, the B.t.u. per kilowatt-hour, which is considered perfect operation for the eight-hour run, actual B.t.u. per kilowatt-hour and grade in per cent.



LAYOUT OF BLACKBOARD IN BOILER ROOM SHOWING COMPETITIVE RESULTS FOR ONE DAY

The bogeys are determined from previous experiences. The attached curve shows the B.t.u. per kilowatt-hour that must be made in order to get a grade of 100 per cent.

By posting such performance for each day, a sporting spirit is aroused between shifts which is of more desirable character than that induced by most bonus systems. With this scheme no individual gets more and consequently greater team work is established. Members of a shift that has not obtained as high a percentage of the bogey as the other shifts will urge their associates to do this or that which they may have failed to do in order to secure a higher shift standing. Furthermore, individuals on any shifts are not so likely to neglect their duty when they realize that they will be the concentrated point of criticism of the entire shift by so doing.

The grade given each shift for its performance does not depend on the load. The shift which generated 40,000 kw.-hr. has as much chance to obtain a grade of 100 per cent as the shift which generated 80,000 kw.-hr. This prevents the men on the shift having a light load from taking the attitude that there is no use trying to get a good grade—that the light load existing on that shift prevents their having a fair chance.

STATION FUEL RECORD

Date, Dec. 28, 1924	Morning 12 midnight–8 a.m.	Day 8 a.m.–4 p.m.	Evening 4 p.m.–12 midnight
Output, kilowatt-hour	41,000	66,250	68,900
Oil burned, gallons	5,794	8,476	8,792
Kilowatt-hour per gallon	7.1	7.8	7.8
B.t.u. per kilowatt-hour (*A*)	20,100	18,370	18,350
100 per cent = (*B*)	19,000	17,750	17,650
Percentage = *B*÷*A*	94.6	97.1	96.3

Eliminating "Cloudy Finish" by Electric Baking

BY F. ARNOLD
Plant Engineer White Sewing Machine Company

THE salability of many articles depends upon appearance. In such cases, a good enamel finish is more than a protection; it is a salesman. Realizing this, the White Sewing Machine Company has thoroughly studied the problem of making the enamel finish on its sewing machine heads more attractive without sacrificing durability. After a great deal of experimenting, a fine enamel and varnish were developed that, when properly baked, would give a durable and brilliant finish.

However, we soon found that unless the oven conditions were just right, results would not be perfect. We found that out of each heat a few sewing machine heads would be just a little dull and smoky. We determined to eliminate these rejections completely.

Electric ovens were installed to bake the enamel, and the results exceeded our expectations. Since this

equipment has been in operation, we have not had a single rejection due to improper baking. Every head coming from these ovens has had a clear, brilliant enamel finish. Due to the use of electric heat, we are getting results that we could not get with gas for fuel.

A description of the enameling process may be of interest. When the heads come to the japanning department, the machine work has been completed. They are first cleaned, and then the primary or filler coats applied. After they have been baked, they are taken to the finishing room, where they are sprayed with the finish enamel, hung on specially designed trucks and placed in the ovens.

The japanning ovens are of the kiln type, 7 ft. 9 in. high, 10 ft. wide and 10 ft. deep. The oven heaters are arranged in two independently controlled banks on each side wall. A fine mesh shield protects the heads from direct radiation. Total demand is 75 kw. per oven.

A typical run is as follows: 288 pieces weighing about 18 lb. each were loaded on racks weighing about 600 lb. Total load, 5,784 lb. Placed in the oven at 10:30 a.m. and one bank of heaters turned on. Automatic control regulated to a maximum temperature of 150 deg. F. At 12:30 the other bank is turned on, the temperature rises and is automatically maintained between 370 and 380 deg. F. The heads are baked at this temperature until 1:30 p.m., when one bank is turned off again. At 5:30 p.m. all the heat is turned off, and at 10 p.m. the doors are opened. The use of a heavy enamel, together with this long baking in the electric oven, gives us fine results that we have not been able to obtain in any other way. The total power consumed for this bake is about 240 kw.-hr.

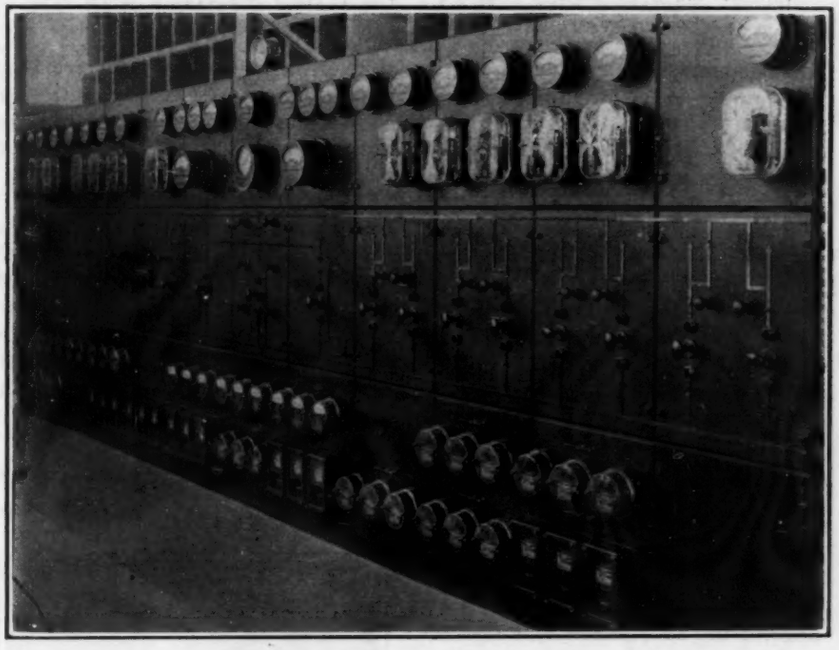
After the japan has been applied, the ornamentation is added. This consists of a decalcomania transfer, and is added in several places on each head. They are then returned to the finish room, where the varnish is applied. This is done by spraying. They are then placed in another electric oven, where they are baked at about 200 deg. F. We have found that the electric ovens in this case give better results, not only because the finish is clear and brilliant but because the work comes out clearer.

Experience with Automatic Substations

BY E. K. SADLER
Engineer Operating Department
San Joaquin Light & Power Corporation, Fresno, Cal.

NEED of improving service without increasing cost of operation has been the main reason for installing automatic switch-reclosing mechanism on the system of the San Joaquin Light & Power Corporation, Fresno, Cal. In the case of new substations in outlying districts the cost of additional property and buildings necessary to take care of an operator is alone much greater than the cost of making the substation completely automatic. The service at substations in small towns employing no regular operator has been greatly improved by the installation of automatic reclosing equipment. In cases of this kind the station is attended by some employee in the neighborhood. In other cases it has been found possible to release the operator by making the substation automatic.

Work was started in 1921 on the first automatic substation on this system. At that time there was on the market no available equipment, reasonably priced, suitable for the needs of the station being planned. The circuit breakers for the station had already been purchased. It was found advisable completely to design the needed automatic reclosing equipment and to build it in our own shops. The equipment was designed and built at a considerable saving to



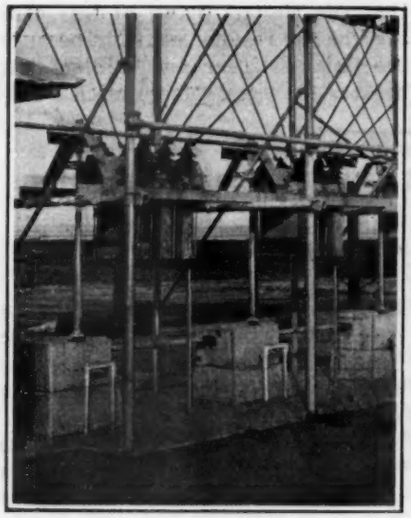
FEEDER PANELS IN AN 18,000-KVA. AUTOMATIC SUBSTATION SHOWING TYPE SS RELAYS CONTROLLING TWELVE FEEDERS

AUTOMATIC SUBSTATIONS IN SERVICE ON SYSTEM OF SAN JOAQUIN LIGHT & POWER CORPORATION

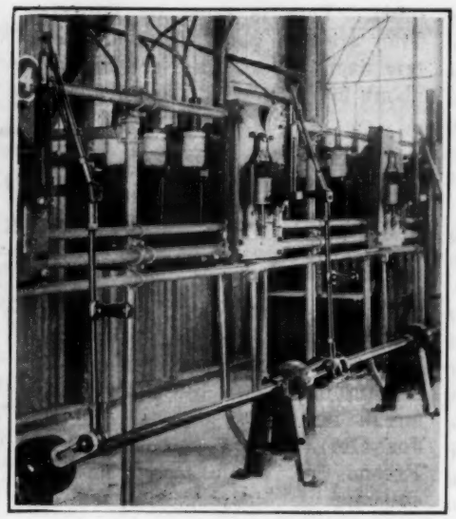
Name of Substation	Capacity, Kva.	Secondary Voltage	Feeder Circuits	Operating Duty in Seconds
Shafter	4,500	11,000	4	120–120–120
Los Banos	2,000	11,000	4	60– 60– 60
Crane Valley	1,500	20,000	1	120–120–120
Lompoc	1,500	11,000	4	60– 60– 60
California Ave	18,000	11,000	12	15– 15– 15
Le Grand	7,500	11,000	4	15– 15– 15
Los Alamos	1,500	11,000	3	60– 60– 60
Paso Robles	1,500	2,300	2	36– 36– 36

OPERATING RECORD FOR AUTOMATIC SUBSTATIONS FOR FIRST EIGHT MONTHS OF 1924

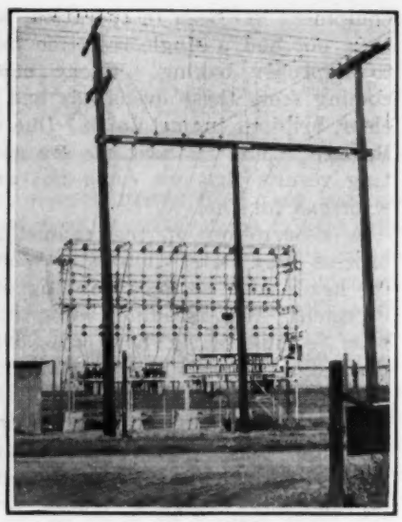
Name of Substation	In Service	Kickouts	Lockouts	Correct Operation, per Cent
Shafter	3 Years	29	1	100
Los Banos	20 Months	39	1	98.5
Crane Valley	20 Months	36	3	100
Lompoc	16 Months	73	12	100
California Ave	1 Year	56	8	100
Le Grand	9 Months	..	..	..
Los Alamos	8 Months	..	..	..
Paso Robles	4 Months	..	..	..



SHAFTER SUBSTATION WITH TYPE S-1 RECLOSING MECHANISM



LOS ALAMOS SUBSTATION WITH TYPE S-2 RECLOSING MECHANISM



SHAFTER 4,500-KVA. AUTOMATIC SUBSTATION

the company. This type of equipment was used, with but minor changes to meet the type circuit breakers installed, at the first five substations made automatic by this company. The same scheme, but redesigned and made by an outside manufacturing company, was used on the later installations.

Seven of the automatic substations shown in the accompanying table are unattended, some of the stations being several miles distant from the nearest place where an employee is located. In case of a lockout an alarm circuit is energized which calls the nearest attendant. The 18,000-kva. station is attended by one operator on a shift. The twelve feeder switches here are automatically reclosed by means of SS relays. Logs of the substations operated are kept by seven-day recorders with an indicator for each switch.

Automatic substations on this system are inspected once a month, the same as attended stations. The records of the company have shown not only that automatic substations are a means of improving service but that operating and maintenance expense is considerably less than for attended stations. During the three years service of our automatic substations only three failures of operation of the automatic reclosing switches have been experienced. The operation of the first substation made automatic has been 100 per cent to date. Records of operation covering the first eight months of 1924, shown in the accompanying table, indicate 176 satisfactory operations and only two unsatisfactory operations. The satisfactory operations were 99 per cent of total.

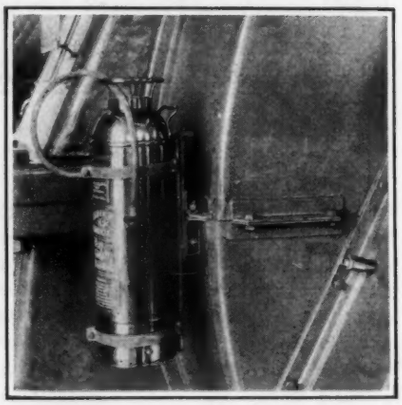
There are four types of reclosing apparatus in use at the automatic substations on this system. A brief description of this apparatus is given below:

Type S-1 Mechanism. This is a reciprocating type of mechanism for the reclosing of a gang of hand-operated switches, and will handle any number of circuit breakers up to twelve. The mechanism is driven by a 1-hp. motor and is absolutely selective. The locking out of any control circuit in no way interferes with the operation of the other switches. Standard latching and unlatching relays are used in connection with the mechanism. The automatic reclosing in no way interferes with the manual operation of the switches. The mechanism is used for both indoor and outdoor service.

Type S-2 Mechanism. This is an improved design of the S-1 mechanism. The scheme of operation is the same, but the motion of the driving mechanism was changed from a reciprocating to an oscillating motion, which greatly simplified the mechanical construction. The latching and unlatching relays were also replaced by a simple lockout and alarm relay built specially for this service. Only ½ kva. is required to operate the mechanism. Selectiveness is obtained by means of a specially designed magnet clutch. A standard mechanism gives three reclosings at any desired time interval before locking out any circuit breaker. The intervals between reclosings of any circuit breaker in the gang can be changed at will.

Type S-3 Mechanism. This is a very simple mechanism for single-switch reclosing. It is small in size, requires no relays and is very simple to set up. It can be attached to any manually operated switch within the limits of its maximum closing effort, which is 3,000 inch-pounds at the operating shaft. In actual size the mechanism is only 12 in. x 12 in. x 14 in. over all. It requires only ½ kva. to operate it. Any time interval from 4½ seconds to 72 seconds can be obtained and any number of closings before lockout up to nine. The actual time for the circuit breaker to go from open position to

Fire Extinguisher Mounted on Synchronous Condenser



ON SOME of the older type machines not equipped with a fire-fighting system the Pacific Gas & Electric Company mounts extinguishers in the manner shown. Four 2½-gal. soda-acid fire extinguishers are used, one installed on each of the four corners of the machine. The rubber hose is quickly attached by a half turn to the brass nozzle indicated by the arrow, and by releasing a catch the extinguisher turns upside down by gravity. The soda-acid solution is drawn into the windings of the machine by the natural suction.

closed position can also be varied from practically instantaneous up to suit the installation.

The San Joaquin Light & Power Corporation is making automatic such substations as seem adaptable to this type of operation. Two of the substations are on the stub end of 60,000-volt transmission lines, where the only high-tension circuit breaker is a transformer automatic. Two of the stations are on 60,000-volt loop circuits and plans are now under way for two stations where there will be 60,000-volt and 110,000-volt switching equipment. Automatic reclosing feeder switches will be used and a resident operator will do the high-tension switching.

Transmission Losses and Low Power Factor

BY P. C. SHULTS
Interborough Rapid Transit Company, New York

THE CALCULATION of transmission losses due to power factor involves so many repeated solutions of the same equation that the chart shown in Fig. 1 has been constructed. The equation

$$PW = W^2DK/CE^2$$

is the equation used in calculating the loss in watts, where W is the power delivered in watts, P is the loss in per cent of watts delivered, D is the length in feet (one way) of transmission line, K is a constant depending on the power factor and derived from curve shown in Fig. 3, C is the size of conductor in circular mils and E is the voltage between main conductors.

The original chart was designed as a time saver and was plotted with rectangular co-ordinates. This would

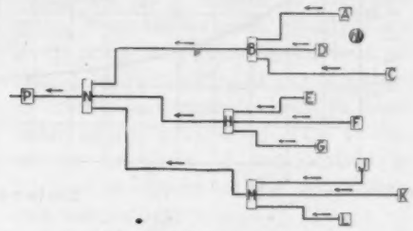


FIG. 2—AVERAGE INDUSTRIAL FEEDER LAYOUT

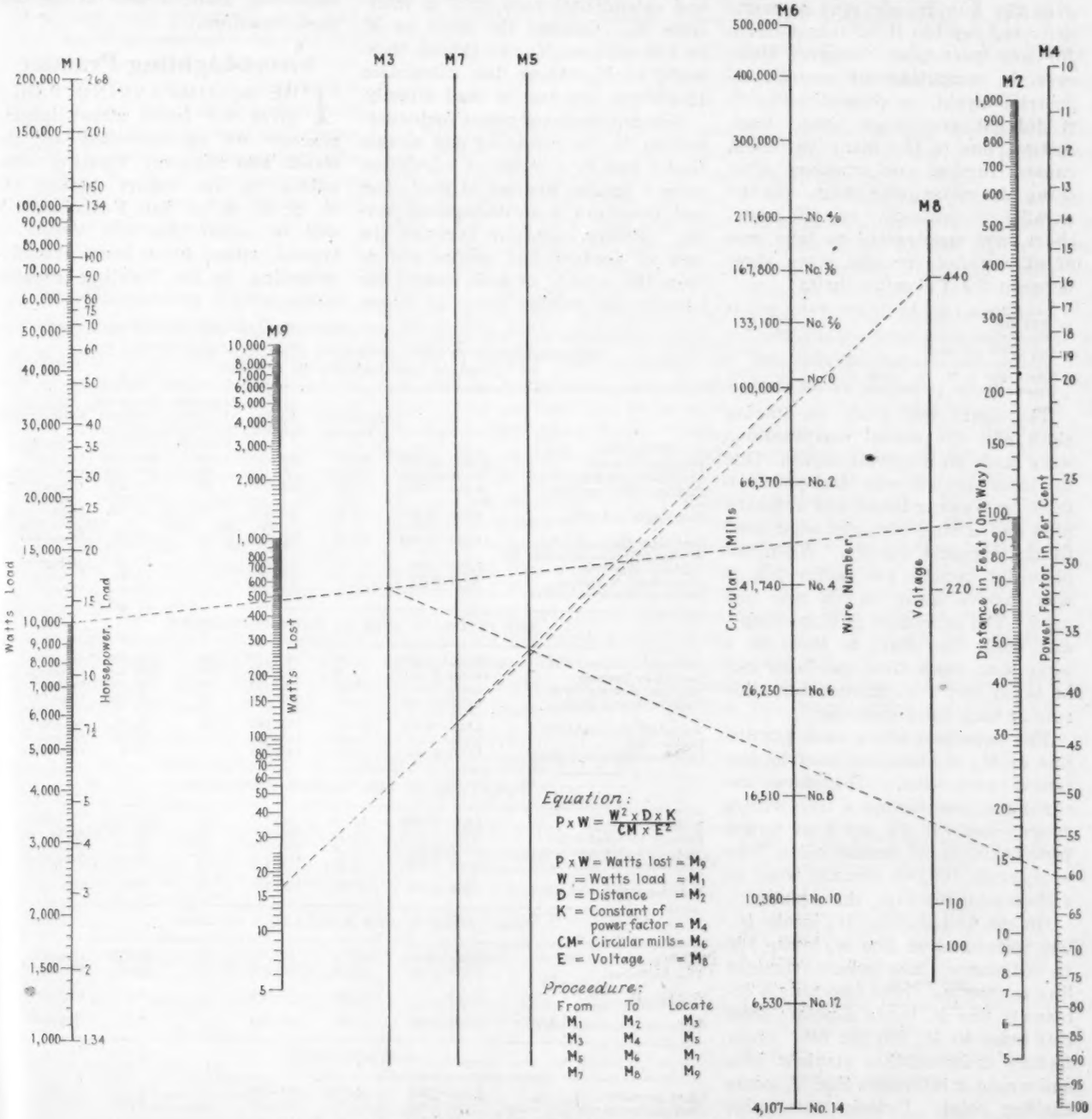


FIG. 1—CHART FOR CALCULATING TRANSMISSION LOSSES

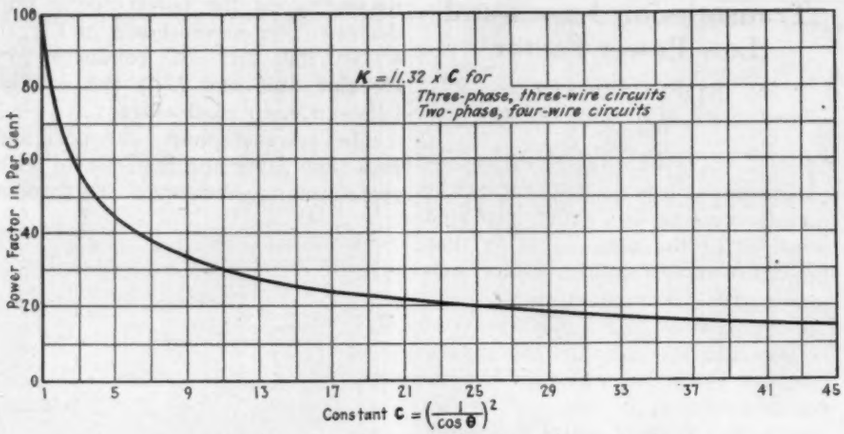


FIG. 3—POWER FACTOR AND CONSTANT CURVE

give the loss in per cent of watts delivered per 100 ft. of transmission for any particular voltage. However, in computing an average industrial layout, as shown in Fig. 2, it did not save much time. Each section, due to the many variables, caused further computations after using the rectangular chart. So the parallel co-ordinate, or alignment chart, was constructed to take care of all variables on one curve sheet between the following limits:

Load from 1,000 to 200,000 watts or 1.34 to 268 hp.
Wire sizes from 4,107 circ.mil (No. 14) to 500,000 circ.mil.
Voltage 100, 110, 220 and 440.
Distance 5 ft. to 1,000 ft.
Power factor 10 per cent to 100 per cent.

The chart was made on tracing cloth and the actual computations were made on blueprint copies. One of these copies was tacked to a table or drawing board and ordinary pins and a steel straight edge used to locate points quickly. When the blueprint became too perforated, it was thrown away and a new one used. The procedure is quite simple and when the chart is made to a large size, much time and labor can be saved over the comptometer, slide rule or long-hand methods.

The notations above each parallel line as M_1, M_2, etc., are used to designate each line. Therefore, assuming a case having a line with a 10-kw. load, at 60 per cent power factor, 100 ft. of transmission (one way) with 100,000 circ.mil wire, at 440 volts, three-wire, three-phase.

On the first line, or M_1, locate 10,000 watts and on line M_2 locate 100 ft. (distance) and where straight line connecting these two points intersects line M_3 locate a point; from this point to M_4 (60 per cent power factor) draw another straight line, and where it intersects line M_5 locate another point. Connect this point on M_5 to 100,000 (circ.mil) on M_6 and extend backward until it intersects M_7. Connect the point on M_7 to 440 volts on M_8 and extend backward to M_9, where the calculation 16.4 watts loss can be read directly.

Now any means of power factor correction on the receiving end of this feeder will by a repeated calculation show a smaller number of watts lost and therefore a corresponding saving. Follow carefully through the web of feeders and mains always from the outside, or ends toward the central distribution point as shown in Fig. 2. That is, calculate the losses in each section, add and calculate the total to the junction point and so on until the system is covered. The total loss in watts, due to the existing power factors, will then be known with a fairly high degree of accuracy. Then by selecting a higher ultimate power factor the power saving due to the increased power factors plus other advantages, as less heating, better regulation, etc., can all be balanced against the cost of the corrective equipment.

If this quantity of repeated calculations were attempted without the use of the chart, the great amount of labor involved would create errors, depending more or less on the personal equation.

Street-Lighting Practice

THE ACCOMPANYING TABLE gives the latest street-lighting practice as recommended by the street and highway lighting committee in its report before the N. E. L. A. at San Francisco. It will be noted that the streets of typical cities have been classified according to the lighting requirements.

RECOMMENDED STREET-LIGHTING PRACTICE FOR CITIES OF 100,000 POPULATION OR LARGER

Street Class	Lumens per Post	Mounting Height, Ft.	Lamp Spacing, Ft.	Minimum Lumens per Foot of Street	Desirable Lumens per Foot of Street	Arrangement of Lamps
Principal business	15,000–50,000	18–25	100–150	400	400–1000	Opposite
Secondary business	10,000–25,000	15–18	80–125	200	200–500	Opposite
Principal thoroughfares	10,000–15,000	15–20	100–150	70	70–200	Opposite or staggered
Boulevards and parks	4,000–10,000	15–20	100–150	30	30–100	Opposite or one side
Secondary thoroughfares	4,000–10,000	15–20	100–150	30	30–70	Staggered
Wholesale manufacturing district, residential	2,500–4,000	13–20	125–200	15	15–30	Staggered
Alleys business section	2,500–4,000	16–20	125–200	15	15–30	One side
Outlying streets and alleys	1,000–2,500	16–20	200–300	3	3–8	One side
FOR CITIES OF 30,000 TO 100,000 POPULATION						
Principal business	10,000–30,000	15–20	80–125	300	300–500	Opposite
Secondary business	10,000–15,000	15–18	80–125	200	200–300	Opposite
Principal thoroughfares	6,000–15,000	15–20	100–150	40	40–150	Staggered
Boulevards and parks	4,000–10,000	15–20	100–150	30	30–100	Opposite or one side
Secondary thoroughfares	4,000–10,000	15–20	100–150	30	30–70	Staggered
Residential	2,500–4,000	13–20	125–200	15	15–30	Staggered
Outlying streets and alleys	1,000–2,500	16–20	200–300	3	3–8	One side
FOR CITIES OF 5,000 TO 30,000 POPULATION						
Business	6,000–15,000	14–18	80–125	120	120–300	Opposite
Primary thoroughfares	4,000–10,000	15–20	100–200	30	30–100	Staggered
Secondary thoroughfares	4,000–6,000	15–20	100–200	20	20–60	Staggered
Residential	2,500–4,000	13–20	150–250	10	10–20	Staggered or one side
Outlying streets and alleys	1,000–2,500	16–20	200–300	3	3–8	One side
FOR CITIES OF 5,000 POPULATION OR LESS						
Business	4,000–10,000	13–16	80–110	80	80–200	Opposite
Thoroughfares	2,500–6,000	15–20	100–200	20	20–60	Staggered or one side
Residential	2,500	13–20	150–300	8	8–15	Staggered or one side
Outlying streets and alleys	1,000–2,500	16–20	200–300	3	3–8	One side
FOR HIGHWAYS						
Light pavement	2,500–4,000	25–35	300–400	6	6–12	One side
Dark pavement and dirt roads	2,500–4,000	25–35	200–300	8	8–20	One side

Commercial Activities and Public Relations

Appeal to Women by Talks in Department Stores

A REPRESENTATIVE of the public relations department of the Georgia Railway & Power Company recently gave a series of lectures in M. Rich & Brothers Company department store in Atlanta describing the utility company's properties and activities. The lectures were given each day at 4.30 p.m. for a week and were presented in a way that would particularly interest the women who were shopping in the store at that time. A large relief map of the company's system was used, and enough interest was shown by the hundreds of housewives who attended to cause the company to determine to carry out similar programs in other stores.

New-Business Plans Outlined a Year in Advance

IN ORDER to avoid untimely and unprofitable sales effort and to enable all individuals to plan their work to coincide with the department's plans, C. L. Dunn, general new-business manager of the Ohio Public Service Company, at the beginning of this year made up a complete schedule of the commercial activities for the company's divisional new-business departments during 1925.

In addition to regularly scheduled appliance, fixture and lamp campaigns, the first three months of the year were devoted to making a thorough canvass of the territory served. With a list of prospects obtained from the canvass and the general plan of the department, each salesman could map out a schedule that would enable him to approach his prospects at the psychological time and thus reduce wasted effort to a minimum.

The new-business department endeavored to allocate each special campaign to a season of the year when it would be most effective and by putting emphasis on various all-year-round activities at various times to enable salesmen to keep in touch with every prospect. The twelve-month schedule of commercial activities is shown in the accompanying tabulation.

Cafeteria Has 125-Kw. Cooking Load

Salt Lake City Restaurant Serves 54,000 Electrically Cooked Meals per Month, Which Require an Average of 0.315 Kw.-Hr. per Meal

ONE of the most interesting examples of complete electrification in the restaurant business is that of Shay's Cafeteria in Salt Lake City. In this cafeteria electricity has been utilized for practically every purpose where it is feasible. At the soda fountain toasted sandwiches are made in an automatic electric sandwich toaster. Coffee is served from a battery of six electric percolators, and steam-table foods are kept hot in an electrically heated steam table. Soiled dishes are carried on an electric elevator to the basement, where they are cleaned in electrically operated steam dish washers.

At the rear of the main dining room, which has a seating capacity of 400, is a short-order department, where orders are filled for toast, eggs, waffles, hot cakes, broiled meats and so forth. These orders are all cooked on electrically operated and electrically heated devices. At the end of the serving counters coffee or chocolate is served from three electrically heated urns.

In the kitchen the heavy-duty cooking equipment is installed. It consists of one Edison 120-loaf oven, which operates all day to supply the demand for pies, cakes, bread and rolls. In the range section is installed a sixty-loaf roasting oven to handle the roast meats, macaroni and baked dishes. A battery of three Edison hotel-type ranges 12 ft. long completes the electrical installation in the kitchen. All of the range work of the cafeteria is done on these ranges. Steam vegetable cookers take care of the boiling operations in the kitchen, while a steam pressure cooker handles the steam parboiling and other work of this class. This steam is supplied by the building in which the cafeteria is located.

In the basement is the refrigeration plant, which supplies ice boxes,

OUTLINE OF OHIO PUBLIC SERVICE COMPANY'S NEW BUSINESS ACTIVITIES FOR 1925

January

Start canvass of all customers which will be completed by March 31 regardless of other campaigns.
Sell Mazda lamps on a wattage basis. We should increase our average watts per lamp sale at least 20 per cent.
Begin washer and ironer campaign Jan. 12.

February

Continue canvass and lamp sale.
Finish washer and ironer campaign Feb. 10.
Talk better fixtures, table and floor lamps.

March

Finish canvass.
Push Mazda lamp sale.
Extra effort on store lighting.
List from canvass all houses not wired and make drive on same.
Continue pushing table, fixture and floor lamps.

April

Talk Mazda lamps, fixtures and floor lamps.
Special campaign on vacuum cleaners.
Push store and sign lighting.

May

Continue talking Mazda lamps, fixtures, etc.
Campaign on electric refrigeration.
Push window, store and sign lighting.

June

Campaign on socket heating appliances.
Fans and refrigeration.

July

Midsummer sale of all shop-worn and obsolete appliances.

August

Washer and ironer campaign.
Sign and window lighting campaign.

September

Begin Mazda lamp drive; also push fixtures, table and floor lamps.
Vacuum cleaner campaign.
Continue sign campaign.

October

Continue on Mazda lamp drive.
Conduct campaign on table lamps.
Sign campaign, store and window lighting.

November

Push Mazda lamps, sign, store and window lighting.
Fixture campaign.

December

Christmas appliances.
Decorative lighting for street, window and stores.
Campaign to light your home properly for Christmas.

Commercial Electric Cooking Equipment in Salt Lake City Cafeteria

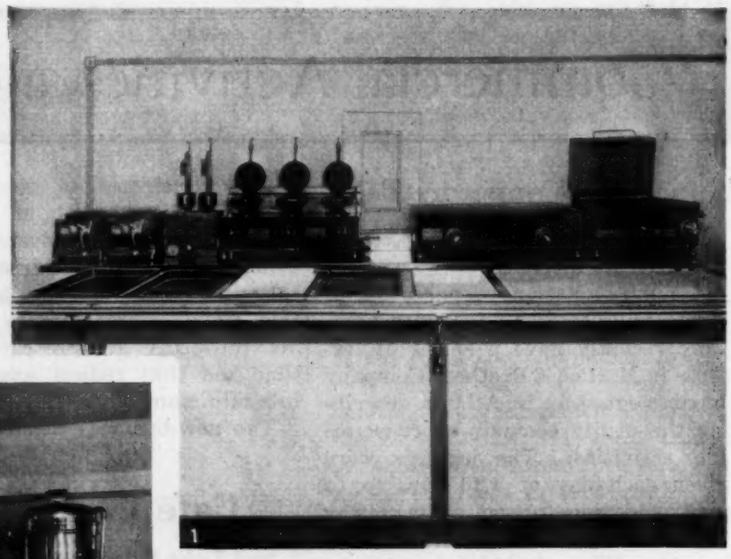
1. Short-order counter equipped with two automatic toasters, one egg boiler, one three-section waffle baker, one 36-in. fry griddle and one horizontal broiler.

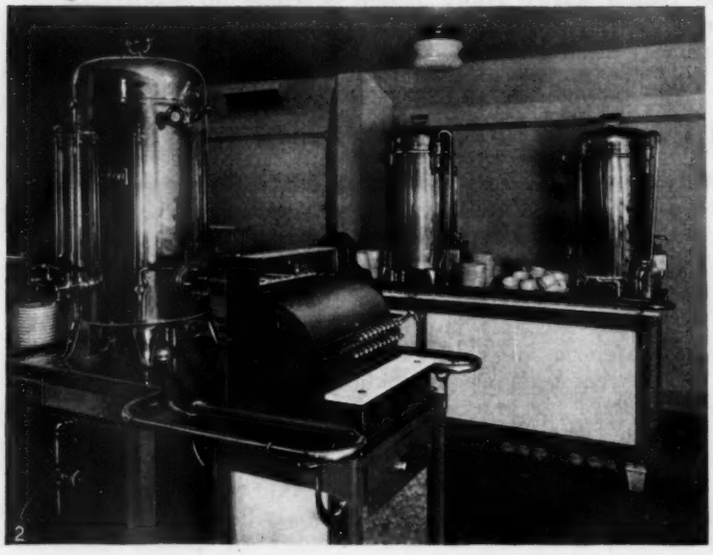
2. Three electric coffee and chocolate urns.

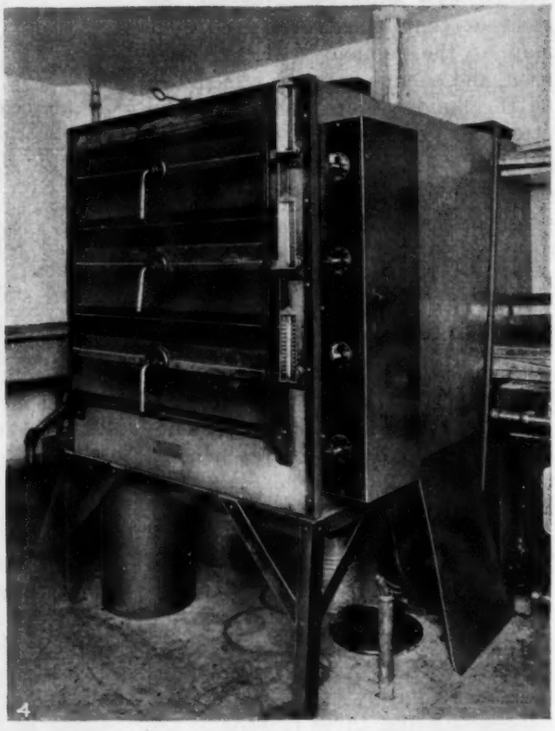
3. Baking and roasting oven of sixty-loaf capacity.

4. Pastry oven, 120-loaf capacity, which operates all day.

5 and 6. Soda fountain and main dining room of Shay's electrical cafeteria in Salt Lake City.







GENERAL DATA ON RURAL ELECTRIC LINES IN ALABAMA, JUNE 15, 1925

	Date Completed	Miles Line	Total Customers	Customers per Mile	Individual Use	Individual Uses of Electricity Exclusive of Community Enterprises: Customers Average	Customers April, 1925	Average Energy* Consumption per Customer per Mile (Kw.-Hr.)	Average* Cost per Mo. per Customer	Cost per Kw.-Hr., Cents	Community Enterprise	Average Energy per Mo. (Kw.-Hr.)	Per Cent of Total Line	Average Cost per Mo.	Per Cent of Total Line	Cost per Kw.-Hr., Cents	Date Completed
1.	June, 1920	5.5	13	2.3	General farming	10	10	74.2	$5.83	7.9	Gin and gristmill	2,138	74	$61.59	51.4	2.7	June, 1920
2.	Aug., 1922	2.8	9	3.2	Farming	7	7	83.2	5.39	6.6	Industrial school and nursery	1,570	74	105.48	70.3	6.7	Aug., 1922
3.	Dec., 1922	2.0	5	2.5	Farming and dairying	5	5										Dec., 1922
4.	Dec., 1922	2.0	51	25.5	Farming community	50	51	19.2	1.81								Dec., 1922
5.	May, 1923	4.5	9	2.0	Farming	6	7	52.4	3.85								May, 1923
6.	June, 1923		5	6.2	Poultry farming	5	5	128.0	7.27	5.6	Industrial school	1,815	81.2	116.94	86.0	6.4	June, 1923
7.	Aug., 1923	3.5	54	14.4	Farming community	50	54	22.7	1.86								Aug., 1923
8.	Nov., 1923	10.0	97	9.7	Suburban, house gardens	87	96	75.3	4.25								Nov., 1923
9.	Nov., 1923	2.0	58	29.0	Suburban, house gardens	52	55	20.5	1.79	8.6	Street lights	74	1.1	1.19	0.3	1.6	Nov., 1923
10.	Dec., 1923	0.8	2	2.5	General farming	2	2										Dec., 1923
11.	June, 1924	2.0	15	7.5	Summer resort, house gardens	15	15	21.8	1.72	7.8	Gin	2,192	73.1	76.69	52.7	3.4	June, 1924
12.	July, 1924	5.0	80	16.0	Dairying and truck farming	69	80	15.1	1.50								July, 1924
13.	Sept., 1924	5.3	76	14.3	Cotton farming	70	74	29.6	2.28								Sept., 1924
14.	Oct., 1924	6.0	120	20.0	Farming community	102	120	26.0	1.98								Oct., 1924
15.	Oct., 1924	3.8	68	17.9	Suburban, dairying	59	68										Oct., 1924
16.	Oct., 1924	6.25	108	17.3	Farming community center	98	108	18.3	1.77	9.8	Gin, gristmill and street lights	3,526	77.0	129.89	55.0	3.7	Oct., 1924
17.	Oct., 1924	7.5	52	6.9	Truck farming	49	52	20.7	1.83	8.8	Street lights	570	15.8	22.91	8.9	4.0	Oct., 1924
18.	Nov., 1924	2.6	11	4.2	Dairying and truck farming	10	11	94.0	4.03								Nov., 1924
19.	Nov., 1924	3.2	54	16.8	Dairying	51	54	40.4	2.43	6.0	Street lights	302	17.0	18.38	9.4	6.1	Nov., 1924
20.	Nov., 1924	2.5	4	1.6	Dairying	4	4										Nov., 1924
21.	Dec., 1924	2.0	17	8.5	General farming	17	17										Dec., 1924
22.	Dec., 1924	6.0	109	18.1	Truck farming and suburban	97	109	24.6	1.89								Dec., 1924
23.	Feb., 1925	10.0	87	8.7	Cotton growing, pecan orchards, three gins	76	92	13.8	1.30								Feb., 1925
24.	Mar., 1925	3.5	26	7.4	General farming and schools	26	26										Mar., 1925
25.	Mar., 1925	10.5	128	12.2	General farming and cotton	128	128	11.4	1.54								Mar., 1925
26.		12.0	170	14.2	Dairying and general farming	170	170										Dec., 1924
27.		6.0	45	7.5	Dairying and general farming	45	45										Feb., 1925
	Total completed	128.05	1,473	11.5		1,311	1,467	30.0	$2.36								Mar., 1925

NOTE: At the present time there are no community enterprises on the other existing lines. However, there are several gins which will take service during next ginning season.

*Lines that have been in operation one year or more, the average energy consumption and cost is for one year ended April, 1925. Other lines, the average is from time of completion through April.

iced counters, soda fountain and other cooling chambers. In addition to the refrigerating plant, other motor-driven devices are an ice cream freezer, potato peelers, dishwashers, glass washers, and tray purveyors that carry the soiled dishes from both floors of the dining room to the basement.

An electrically driven ventilation system, which forces washed air into the dining room through vents, also draws the air out through other ducts, making a complete change of air every five minutes. The total connected load is 125 kw. in electrical cooking equipment, 50 hp. in motors and approximately 18 kw. in lighting. The demand of the installation is 66 kw. (monthly load factor 39 per cent) for cooking, 6.75 kw. for lighting, and 22.08 kw. for power.

Since the opening of the cafeteria about 54,000 meals have been served per month, requiring 17,000 kw.-hr. to cook them, or an average of 0.315 kw.-hr. per meal.

This is the largest electrical cooking load for general restaurant work in the western part of the United States. It is also the most complete from the standpoint of equipment to do the various tasks formerly done by other fuels and motive power. Records show that in actual operation figures it is the most economical and most efficient installation in the United States.

1,473 Farms Average 30 Kw.-Hr. Monthly

RURAL service has been undertaken liberally by the Alabama Power Company, which has built twenty-seven lines totaling 128 miles and serving 1,473 customers in five different agricultural sections. In general, the longer the customers have been on the line the larger the consumption. Included among the consumers are general, dairy, truck, poultry, hay, livestock and cotton farmers, cultivating from three acres to 4,000 acres each. A large percentage of the farms are occupied by the owners, but in some instances renters are receiving service. Community enterprises are sought on every line to augment the consumption of energy. Some of the results that have been obtained through the co-operation of the Alabama Experiment Station are shown in the table at the left, the farmers buying all of their equipment. Prof. M. L. Nichols, Alabama Polytechnic Institute, is project director.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Low-Head Propeller Type Water Wheels.—G. TROELTSCH.—An Austrian power station has installed some of the first propeller type water wheels of large output at low head. Erecting a dam across the Traun River, a hydraulic head of 19 ft. was obtained, which is utilized in the power house, located immediately behind the dam. A water volume of 1,750 cu.ft. per second is available, which is directed through three vertical shaft Kaplan turbines. These have four propeller wheels, 75 in. in diameter, developing at the named head 1,100 hp. at 250 r.p.m. By means of a simple lever mechanism, located within the hub of the runner and actuated through the hollow vertical shaft, the tilt of the four runner blades can be changed during the run of the wheel. In this way the efficiency of the turbine can be adapted to the prevailing load, which is done automatically by the governor of the wheel. The present article gives only the description of the turbines.—*Elektrotechnik und Maschinenbau*, May 31, 1925.

Ratios in Power-Plant Design.—JOHN G. FAIRFIELD.—The author has grouped together forty charts and a large number of convenient rules for checking and for making quick estimates.—*Power*, June 30, 1925.

Power Possibilities at Muscle Shoals, Alabama.—SAMUEL S. WYER.—An abstract of this paper may be found in the report of the Saratoga Springs convention of the A. I. E. E. in the ELECTRICAL WORLD, July 4, 1925, on page 15. —*Journal of the A. I. E. E.*, June, 1925.

Present Status of San Francisco's Hetch Hetchy Project.—A summary is given of construction and expenditures to date and a résumé of work still necessary before water can be delivered to San Francisco. The costs include $9,364,000 for power construction; the first installation, at Moccasin Creek, consists of four 25,000-hp. impulse wheels to operate under a head of 1,250 ft.—*Engineering News-Record*, June 18, 1925.

Transmission, Substations and Distribution

Progress Made in Transformer Design.—J. F. MÜLLER.—For all voltages of 10,000 or more the dry, air-insulated transformer has been almost completely superseded by the oil-insulated type. Of great importance was the introduction of standard transformer units, comprising certain standard capacities and voltage ratios. Primarily for agricultural purposes a series of transformers for a twelve-hour, 100 per cent overload was established, having at the same time very low core losses. Further to reduce no-load losses so called "change-over" transformers are being offered. The winding of these is operated at full load in delta-delta and at low load in star-star. The change-over can be readily accomplished by means of a small controller, lodged on top of the transformer core, and operated by a handle through the cover. Machines up to 100 kva. use extensively wood as an insulating construction material. It is quite reliable for the moderate voltage occurring on transformers up to that size and it displaces an appreciable amount of expensive oil. Above 15 kv. end-turns on both sides of the coil stack are today always reinforced insulated. Hard paper cylinders of substantial wall thickness represent the major solid insulation between high and low voltage windings. While German transformers practice prefers lacquer impregnated coils, Austrian practice calls for a treatment of the coils with zinc-white paste. The latter gives the windings an almost rock-hard finish, which gives electrically and mechanically excellent results. Ratio adjusters, operated from the outside, are being furnished in growing numbers.—*Elektrotechnik und Maschinenbau*, June 14, 1925.

Over-Voltage on Transmission Systems Due to Dropping of Load.—E. J. BURNHAM.—This paper was presented at the Saratoga Springs Convention of the A. I. E. E. An abstract may be found in the ELECTRICAL WORLD, July 4, 1925, on page 18.—*Journal of the A. I. E. E.*, June, 1925.

Transmission System of the Southern California Edison Company.—H. A. BARRE.—This article contains a brief history, map, illustrations and description of a system consisting of 540 circuit miles of 220-kv. lines, 2,170 of 66-kv. and seventy of 33-kv. lines.—*Electric Journal*, June, 1925.

Units, Measurements and Instruments

A Simple Method of Calculating Magnetic Conditions in Electrical Machinery.—C. MACMILLAN.—After discussing the characteristics of magnetic materials and of the magnetic circuit of electrical machines, and the various methods that have been suggested for dealing with such circuits practically in design, the author shows by test data obtained on a number of motors that the magnetization curves for the iron portion of the circuit, after eliminating air-gap reluctance, appear as straight lines when plotted on semi-logarithmic paper. The examination is extended to such dissimilar materials as permalloy and chrome magnet steel. From the charts he derives corresponding equations and comes to the conclusion that in strongly magnetic materials the basic relation between the internal values of B and H in a homogeneous portion may be expressed by the equation $B = c \log H$. He suggests that the modifications to this equation when applied to externally measurable values of B and H are due to the fact that the latter represent only net surplus values, and points out that if it can be confirmed as the expression of a rigorous physical law it would be of the same form as Fechner's law of stimulus and sensation, the latter varying in arithmetical progression with geometrical progression in the former.—*General Electric Review*, May, 1925.

Tests of CO_2 Recorders.—J. F. BARKLEY.—A graphical record of tests against an Orsat apparatus of four modern types of instrument, continued for a period of nearly two months, is presented. Some of the indications show a rather large error, although the author's conclusion is that in general the CO_2 instruments on the market give accurate results when all conditions are favorable. The statements are so general that the reader will find difficulty in drawing specific conclusions. This article is taken from Reports of Investigations, Department of the Interior, Bureau of Mines.—*Power Plant Engineering*, May 15, 1925.

Generation, Control, Switching and Protection

Protective Relay.—J. BIERMANNS.—Complex feeder systems demand a selective protection, so arranged that a short circuit on one feeder must remain localized to this one feeder without interfering with the remainder of the network. The ideal relay for this purpose would have to be absolutely independent of the nature of the load and the configuration of the network must be simple, reliable and inexpensive. In its operating principle such a relay must be sensitive to current and voltage changes and to current reversal. A Ferraris type of relay, claimed to answer all of these requirements, called "distance relay," is described in this paper, and its use in large networks is fully explained.—*Elektrotechnik und Maschinenbau*, May 17, 1925.

Diesel Motors for Peak-Load Periods. —M. GERCKE.—The far-reaching advantages and economies of super-power systems, such as are being developed in daily growing numbers, are being considerably hampered by the greatly varying load peaks occurring at certain time or season periods and at certain localities served by the system. To offset these conditions requires either the connection of decentralized auxiliary generating stations or the installation of special peak load generating units in the existing stations. Prime movers of the internal combustion type, in particular Diesel motors of very large capacity, are primarily suited for the latter purpose. The present elaborate paper is an economical study to show why and to what an extent a modern Diesel motor is the ideal type of prime mover for these cases in preference to the steam turbine as the only other possible machine. The cost and operating data given in the paper are based on Diesel engines, motors of 10,000 and 15,000-hp. output, examples of which are today in successful operation in a number of plants. Considering operation from 500 to 2,500 hours per year, the author gives complete comparative cost data for a steam turbine peak load plant of 12,800 kw. and a Diesel motor plant of 13,200 kw. capacity. Both stations contain two units

each. The installation cost for the Diesel station is about 22½ per cent higher than for the steam plant. With up-to-date machinery operating costs will be about the same for both stations up to about 2,000 hours per year. Beyond this figure the steam plant will run more cheaply. Several curves are given to show in detail the operating efficiency and the caloric performance of both types of prime movers for various lengths of operation. In an appendix to the main article the author shows the economic advantages in producing the fuel oil for the peak plant as a by-product from the coal from the main plant by the installation of a coking plant.—*Elektrotechnische Zeitschrift*, June 11, 1925.

Motors and Control

Electric Mill Operation.—Early in the year *Iron and Steel Engineer* published an exhaustive tabulation showing the use of electric drive in steel mills, as was noted in the Digest at the time. An analysis of these figures, covering 1,108 units totaling 1,312,315 hp., is now given in a form showing the number of units and the total horse power installed during each year from 1905 to 1924 inclusive. Another table classifies the installations according to type of mill and size of unit. A chart shows the annual installation divided into three classes according to size of unit, using 2,000 and 5,000 hp. as dividing points for the three classes.—*Iron Age*, June 25, 1925.

Heat Applications and Material Handling

Temperature Regulation with Electron Tubes.—W. TAEGER.—A very close and automatic temperature regulation of any kind of gas, oil or electrically heated furnace, without requiring any moving parts, is described in this article. Advantage is taken of a combination of thermocouples and vacuum tubes. A schematic arrangement is shown for such a system used on an electric resistance furnace. The author goes into great mathematical detail explaining the theory of this temperature regulation, and showing the method to determine by calculation the type of vacuum tube and the number required. The developed theory is further explained by a practical example. If this method is used on gas or oil-fired furnaces, electrically operated fuel valves will, of course, have to be installed.—*Elektrotechnik und Maschinenbau*, June 14, 1925.

Results of Automatic Welding.—J. T. PORTER.—Tests on 122 37-in. rolled steel wheels used in high-speed interurban service between Dallas and Fort Worth, Tex., show that for every ½ in. turned off the tread for the purpose of restoring the flanges about 30,000 miles of service are lost. Against this method studies have been made of the cost of reclaiming wheels by building up worn flanges by welding. Itemized data are presented from which it appears that the total shop cost per wheel for 346 wheels ranges from an average of $2.85 for the 22-in. size to $5.38 for the 36-in. wheel.—*Electric Traction*, June, 1925.

Electrophysics, Electrochemistry and Batteries

The Motion of Electrons Between Coaxial Cylinders Under the Influence of Current Along the Axis.—A. W. HULL.—The magnetic field of the heating current has frequently been mentioned as a factor which should be considered in electron tubes; with filaments of ordinary size it is very small, but with very large ones it may play an important rôle. In the present paper this question is investigated theoretically and experimentally. The experiments show that in the case of symmetrical cylindrical electrodes and large heating currents the magnetic field is the most important factor and effectively prevents electrons from reaching the anode, even with a very high anode potential. Thus with an alternating filament current the plate current is suppressed except during the part of each cycle when the instantaneous filament current is below the critical maximum. The paper includes several oscillograms illustrating this latter effect, as well as charts summarizing the results of various tests. Experiments were also made with a Pring tube containing a filament and metal disk, and verified Langmuir's explanation that the decrease of electron emission with improvement of vacuum is due to charge on the glass walls.—*Physical Review*, May, 1925.

The Effect of Light on the Thermo-Electric Power of Selenium.—R. M. HOLMES.—A temperature gradient was established in pure crystalline selenium and the thermal emf. and resistance were measured for various illuminations with white light. Light caused a decrease of about 5 per cent in thermo-electric power, corresponding to an increase of about 500 per cent in conductivity. An explanation of these effects is suggested. It is pointed out that in a circuit entirely of selenium, homogeneous in every respect except that two sections have temperature gradients of opposite sign, if one section is illuminated a large thermal emf. will be developed in the circuit. The dark values for different samples were between 0.99 and 1.14 millivolts per degree against copper.—*Physical Review*, June, 1925.

Traction

Mercury Arc Rectifiers on French Railway.—B. SCHAEFER.—Along the 66-mile main railroad between Pau on the Atlantic Ocean and Montrejan on the Mediterranean are placed seven substations to supply 1,500-volt direct current to the overhead lines, which is being transformed from the 60-kv., three-phase feeder to 1,425 volts, and is then rectified by large mercury arc rectifiers. The total output of these rectifiers is 19,200 kw. Each rectifier group has a capacity of 1,200 kw. and comprises two units in parallel. The transformers feeding these groups are wound twelve-phase; that is, have each four groups of coils, supplying circuits 30 deg. phase displaced against each other. The transformer-rectifier groups are dimensioned to withstand 50 per cent overload for two hours, 200 per cent overload for five minutes and ten dead short circuits in intervals of one minute. The characteristics of the rectifiers are as follows:

Load	5/4	4/4	2/4	1/4
Direct-current current	1,010	790	403	195 amp.
Direct-current output	1,585	1,262	655	326 kw.
Cost	0.965	0.962	0.905	0.805
Efficiency	95.0	95.1	94.5	92.0 per cent.

Excellent operating results have been recorded during the two years of operation.—*Elektrotechnische Zeitschrift*, June 4, 1925.

Telegraphy, Telephony, Radio and Signals

Optimum Damping in the Auditive Reception of Wireless Telegraph Signals.—T. B. TURNER and F. P. BEST.—The paper is an account of an experimental investigation of the extent to which it is advantageous to reduce the damping in a receiver for telegraphic signals from modern continuous-wave stations, when the usual rectifier and telephone are used as indicator. Numerous determinations of optimum damping were made on signals coming from six commercial transmitting stations of wave lengths ranging from about 4,000 to 23,000 m. The several observations on any one station are consistent among themselves and the measured optimum damping exponents for all stations and wave lengths lie within comparatively narrow limits.—*Journal of the I. E. E. (England)*, May, 1925.

The Parallel Operation of Alexanderson High-Frequency Alternators.—J. L. FINCH.—Although qualitatively the problem of causing high-frequency generators to operate satisfactorily in parallel would seem to be similar to that encountered in ordinary 60-cycle power plants, quantitatively the conditions are so different that the solution is of quite another sort. The load fluctuates rapidly and periodically between full value and zero; damper windings are not practicable; since power is fed into a tuned circuit it may well happen that the lagging machine carries the major load, which tends to make it lag still more. To meet these and other conditions a special method has been devised to stop hunting. One coil of each alternator is segregated and the two are coupled together through transformers to a circuit containing a rectifier and a resistance shunted by a condenser and relay circuit, in such a way as to close the relay while the phase angle is increasing and to open it while the angle is decreasing. The action of the relay is to change the tie circuit between the two machines, so that the synchronizing torque is larger with increasing than with diminishing phase angle between them. The consequent effect of this relay action is to damp out the hunting rapidly.—*General Electric Review*, May, 1925.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Conductors, Overhead, Corrosion Tests on

Results have been obtained on corrosion tests of electrical conductors by a procedure developed to simulate atmospheric conditions as closely as possible in a laboratory. The tests have been made on a wide range of metallic-coated materials.—*Frank F. Fowle, Chicago, Ill.*

Hydro Plants, Draft Tubes for

The recent interest shown in draft tubes as applied to hydro plants has resulted in several comparative tests on models to determine the advantages of various designs, both old and new. The wide range of efficiencies of the various models show the importance of the draft tube when used with a high-specific-speed wheel. The difference in efficiency between the test-flume model and the power-house models show that still greater efficiencies are possible in the design of the collectors.—*National Electric Light Association.*

Insulating Materials, Standard Tests for

The committee on electrical insulating materials recommended revisions in some of its standards and tentative standards, including a substitution of kraft paper base for copper in the dielectric strength test for testing insulating varnishes and in the establishment of some precise procedure for making compression, transverse and dielectric strength tests at high temperatures of molded insulating materials.—*American Society for Testing Materials, Philadelphia, Pa.*

Lamp for Automobile Headlight

Some experimenting has been done with a double-filament headlight lamp having two filaments, each of 21 cp.; one located above the focal point of the reflector and the other below it. By switching from one to the other the beam may be projected far down the road for general driving or thrown on the near foreground for passing approaching cars.—*General Electric Company, Schenectady, N. Y.*

Metals, Non-Ferrous, Fatigue of

The fact outstanding from the tests made on brasses and bronzes is that in comparison with ordinary tensile strength the fatigue strength is relatively much lower than that of wrought ferrous metals. Endurance limits for non-ferrous metals, if any exist, are not nearly so well marked as the endurance limits for wrought ferrous metals.—*H. F. Moore, Urbana, Ill.*

Mine-Lamp Bulbs, Ignition of Fire Damp by Exposed Filaments of

In nearly all coal mines the explosive gas found is methane. This gas is known to be somewhat less sensitive to ignition than natural gas which contains, in addition to methane, one or more of the higher hydrocarbons. Therefore, the question naturally arose whether heated filaments, which regularly ignited natural gas, would also ignite methane. If not, then perhaps the bureau had taken unnecessary precautions in requiring all permissible electric lamps in mines to be equipped with a safety device. The results obtained with methane and natural gas have been now found to be practically the same, and any difference in sensitiveness to ignition between these two gases cannot be shown within the accuracy of tests of this nature.—*U. S. Bureau of Mines, Washington, D. C.*

Storage Battery, Lead, Non-sulphating

A cell was constructed by Féry in which spongy lead was protected from the action of air by a layer of porous material. An accumulator constructed in this way lost only 66 per cent of its charge in twenty-six months, and at the end of four months still retained 83 per cent of its charge, when a cell of ordinary construction had lost practically all its charge. For details see *Comptes Rendus*, 1924, vol. 179, page 1153.

Transformers, Bringing Underground Cables Into

The underground cable is brought up into a compartment filled with fluid insulating compound. This compartment is connected by means of bushings to an upper compartment which is kept filled with oil by means of a pipe leading to the main tank. The transformer high-voltage bushings pass into this compartment through the side of the tank. With this arrangement, cables are brought into the transformer without exposed terminals or live parts.—*General Electric Company, Schenectady, N. Y.*

In Progress or Purposed

Heating, Industrial Electric

The field of industrial heating is now being further extended by including the whole range of annealing, heat treatment, and forging processes. Many attempts have been made in the past to produce successful electric furnaces for this class of work. In some cases, these efforts have been successful to a large degree, and it is confidently expected that improved designs of furnaces, heating elements, refractories and mechanical methods will now open up a field of application much more extended and diversified than any hitherto.—*National Electric Light Association.*

Insulating Materials, Standard Tests for

Experimental work is being done looking toward the development of electrical tests of varnish in the liquid state. Methods of testing laminated-sheet materials for tensile strength, transverse strength, dielectric strength and power factor were recommended as tentative. Work has been started and several laboratories have outlined progress for making investigations of the rate of deterioration of various types of sheet-insulating materials with various deteriorating agencies such as oxygen, ozone, heat, electrical tension, moisture, acidity, catalytic agents, oils and compounds, chemical agents, light and mechanical forces.—*American Society for Testing Materials, Philadelphia.*

Light, Primary Standard of

It is desirable to have a primary standard reproducible from specification, and comparable in accuracy with the present incandescent lamp standard. An American scientist has now reported a primary standard that bids fair to meet this condition. It is based upon the light from a black body at the melting point of platinum, the black body effect being produced by forming a platinum fuse into the shape of a cylinder, with a longitudinal slit along one side. — *General Electric Review*, January, 1925, page 53.

Metals, Fatigue of

Steel castings are coming into more and more common use for machine parts, and there are practically no data available to determine whether they possess as high fatigue strength as parts made of rolled or forged steel. Another inquiry recently initiated, which has large possibilities for useful results, is a search for methods of detecting fatigue failure in its early stages before the minute cracks which mark its beginning have spread far enough to cause the destruction of a machine or structural part.—*H. F. Moore, Urbana, Ill.*

Steam, Properties of

At the Massachusetts Institute of Technology, Dr. Keyes, after many troubles, finally succeeded in getting a pure nickel bomb that was perfect. Measurements of the pressure-temperature-volume relation have been undertaken, starting at around atmospheric temperature and running the whole range from atmospheric pressure up to about 4,000 lb. per square inch. These measurements are being carried on and should be completed within a few months, if no accidents occur.—*Engineering Foundation, 33 West Thirty-ninth Street, New York, N. Y.*

Welding, Arc, Study of

The electric arc welding committee of the A. W. S. has completed studies to note the effect of various fundamentals in the electric arc welding of mold steel. This investigation was started during the war, but was dropped at the close of the war because of the lack of funds. Through the courtesy of the General Electric Company and the Electrical Testing Laboratories the specimens were carefully preserved and are now being tested at the laboratories of Union College. An investigation has also been started on the welding of non-ferrous metals, and samples have been made up by several companies to determine the present state of the art.—*C. A. Adams, Harvard University, Cambridge, Mass.*

Suggestions for Research

Fish Screens, Electric

According to a representative of the California Fish and Game Commission, the so-called electric fish screens, to prevent fish from entering canals and conduits, are not as yet a success. Tests of them have been made; if the voltage is low the fish pay no attention to it, and if the voltage is high the fish are either stunned or killed and float on through.

Punchings, Alternating-Current Generator

In most high-voltage alternating-current generators the stator punchings are assembled in packages, leaving radial ducts for the cooling air that sweeps over the surface of the armature coils where these cross the ducts. The package of punchings is limited by two sharp edges that are in immediate contact with the coil insulation. In the vicinity of these edges the electrostatic field gradient reaches very high value, which might well result in corona formation even at the present voltages. These sharp edges constitute a weak point in the design. A decided improvement could be achieved by having the edges of the external punchings in one package bent along the radial side of a slot, thus relieving the coil surfaces from infinite gradients and reducing chances for corona formation. This improvement should be tried only with a closed system of ventilation and on very large machines where it would really pay. A doubling of the present generator voltage would in many cases save the cost of transformers and, therefore, would be highly desirable.—*Donald Bratt, Brooklyn (N. Y.) Edison Company.*

Railway Trains, Freight, Communication Between the Ends of

In railroad work it is often desirable for the conductor in a caboose to communicate with the engineer, and vice versa, under normal conditions and also when the train parts, or in foggy weather, etc. Different schemes have been developed, making use of the air line, telephone conductors, radio, rail, block-signal relays, line conductors, etc., but none has so far met all the requirements. The equipment has to be rugged, simple, positive in operation, equipped with visual or audible signals, and not too expensive.—*J. C. Johnson, Pennsylvania R.R., Philadelphia.*

Varnishes, Drying-Time Meter for

It is desired to devise mechanical means for coating varnishes and enamel films on a flat surface and to determine mechanically (or electrically) the time required for such films to dry. For some efforts in this direction see a paper by J. McE. Sanderson, presented before the 1925 annual meeting of the American Society for Testing Materials.

Vibration in Machinery and Buildings, Experimental Study of

At the St. Louis convention of the A. I. E. E., C. I. Hall described a simple vibration recorder for pathological analyses, based on reflection of light from a hemisperical mirror. It is possible that a similar device could be developed for investigation of vibration in machinery and in buildings.

News of the Industry

New York Mergers Approved

Two Up-State Utility Combinations Authorized by Commission in Spite of Opposition

THE Public Service Commission of New York last week authorized the formation of the Mohawk - Hudson Power Corporation and the Buffalo Niagara & Eastern Power Corporation in spite of the opposition of the New York City administration, as reported in the ELECTRICAL WORLD of July 11, 1925. The commission, in giving its consent to the combination of many up-state companies between Buffalo and Albany into two large companies, said:

"It will allow greater conservation of resources, greater utilization of waste power and a greater use of existing facilities. It will avoid duplication of generative and transmission facilities. It will permit of a more comprehensive plan of financing and will make financing of hitherto undeveloped resources practicable and economical. It is believed that the proposed plan applies to a larger area and to communities having a diversity of electrical requirements the same principles which have demonstrated that central facilities are better and cheaper than isolated plants for each group of users."

The commission granted the Mohawk-Hudson Power Corporation the right to acquire 75,000 shares of the common stock of the Municipal Gas Company of Albany, 25,000 common shares of the Cohoes Power & Light Corporation, 8,950 shares of first preferred, 133 of second preferred and 3,745 shares of common stock of the Fulton County Gas & Electric Company and $1,055,000 in general mortgage bonds of the latter company and $17,000 first mortgage bonds of the Mohawk Hydro-Electric Company.

By consolidation with the Wanita Holding Company, the Adirondack Power Securities, Inc., and the Adirondack Stockholders' Securities, Inc., the Mohawk - Hudson Corporation obtains 40,000 shares of the common stock of the Utica Gas & Electric Company and 186,756 of the common stock of the Adirondack Power & Light Corporation of Schenectady.

The commission also authorized the Buffalo, Niagara & Eastern Power Corporation to acquire more than 10 per cent of the common stock of the Buffalo General Electric Company, the Niagara Falls Power Company, the Niagara, Lockport & Ontario Power Company, and Tonowanda Power Company.

In its petition the Mohawk-Hudson Power Corporation stated that with the authorization of the merger it will have $7,249,360 cash in its treasury and will not owe any funded or other debts. It will have outstanding 1,444.346 shares of stock having no par value, which will represent a total of $41,413,817 book value as of Jan. 1.

The Mohawk - Hudson Corporation will, it is understood, be owned, 35 per cent by General Electric interests, presumably the Adirondack Power & Light Corporation; 15 per cent by the Power Corporation of New York, 15 per cent by the United Gas Improvement Company and 7 per cent by the Brady estate, the remaining 28 per cent representing securities to be offered to the public.

Duke-Davis Interests Acquire 800,000-Hp. Saguenay Site

The interests headed by J. B. Duke and I. E. Davis, president of the Aluminum Corporation of America, have acquired the 800,000-hp. water power site at Chute à Caron on the Saguenay River from Price Brothers Paper Company, according to an interview given in Montreal by J. M. McCarty, vice-president of the paper company. It is reported that the purchase price was between $5,000,000 and $6,000,000. The Chute à Caron site is a short distance below the 360,000-hp. Ile Maligne plant in the Lake St. John district of Quebec, which is now under construction. J. B. Duke is said to have announced after a recent visit to the site that the plant would consist of ten 80,000-hp. units and that construction would start in the first week in August, making a total power development of 1,160,000 hp. in progress on the Saguenay River. The new company will be known as the Chute à Caron Development Company.

Price Brothers Paper Company has contracted to take 200,000 hp. from the new plants by 1927, when its production of newsprint will have reached 800 tons a day. It is also reported that the Aluminum Corporation of America is planning a huge plant near the development, which will take a large block of power.

Holtwood Steam Plant Opened July 15

On July 15 the Pennsylvania Water & Power Company formally opened the new 30,000-kw. steam station just completed at Holtwood, Pa. The steam station was built to supplement the Holtwood hydro - electric development and will enable the company to handle its load more easily and will eliminate any necessity of purchasing power.

The initial installation consists of two 15,000-kw. units with provision made for an ultimate installation of 150,000 kw., if desired. The station will feed into the same substation that handles power generated at the hydro-electric station and its power will be transmitted over the company's existing 110,000-volt lines. The cost of the initial installation was about $4,500,000, which includes equipment which will be adequate for future additions.

Pinchot Lauds Giant Power

Copies of Pennsylvania Report Sent to All Congressmen with Letter from the Governor

GOVERNOR PINCHOT of Pennsylvania has renewed his campaign for his Giant Power scheme by sending a letter and a copy of the Giant Power report to every representative in Congress. In the letter Governor Pinchot warns against the dangers of a "nation-wide electric monopoly" and emphasizes the fact that while Giant Power does not aim at public ownership it does attempt to break down any monopoly and prevent unfair discrimination against small consumers. In his recent speaking tour through the Western states the Governor devoted his time to the same subject along the same general lines.

A letter to Sol Bloom, Representative in Congress from New York, voices the Governor's sentiments on the issue as follows:

"My dear Mr. Bloom: I am taking the liberty of sending you a copy of the Giant Power report of Pennsylvania in the hope that it may be of use to you in the widespread consideration of Giant Power which is coming.

"Giant Power is a plan for supplying electric current for every purpose to the people of America in greater abundance and at cheaper rates than ever before. It includes the production of electricity in enormous quantities, partly from water powers but chiefly at huge coal-burning central power stations near the mouths of mines; the pouring of that electricity as it were into a great pool of power for the service of all; and the saving of the valuable by-products of coal burned for power. It aims to assist and hasten the rapid expansion of electric service.

"The Giant Power plan undertakes to prevent the nation-wide electric monopoly now almost formed from acquiring industrial, commercial, financial, and political control of this nation. It does not aim at public ownership, but demands that in all plans for electric development the public interest shall receive first consideration. Through effective public regulation it proposes to break down and put an end to the present unfair discrimination in rates in favor of a few great users of electricity and against moderate and small users through which the latter are made to pay extortionate charges.

"Super-power is the name chosen by the electric magnates for their own set-up of a nation-wide electric monopoly. Giant Power and super-power are as different as a tame elephant and a wild one. One is the friend and fellow-worker of man—the other, at large and uncontrolled, may be a dangerous enemy. The place for the public is on the neck of the elephant, guiding its

movements, not on the ground helpless under its knees.

"Giant Power means regulation by the people of the coming electric monopoly. Super-power means control of the people by the monopoly. The principal object of super-power is profit for the companies—not benefit for the public—and it is on the way to being realized with a rapidity which it is difficult fully to understand. If we are to have Giant Power instead of super-power—development in the interest of all instead of development in the interest of a few—the time in which to make sure of it is very short."

Traction Interests Belittle Conowingo

Philadelphia Rapid Transit Company Claims the Philadelphia Electric Company's Project on Susquehanna River to Be Less Attractive than Pictured

DURING the hearings on the Conowingo power project held in Philadelphia before the Pennsylvania Service Commission, the Maryland Public Service Commission and the Federal Water Power Commission, on July 15 and 16, the Philadelphia Rapid Transit Company, which is the largest customer of the Philadelphia Electric Company, produced consulting engineers and accountants to give expert testimony to back up the transit company's opposition to the development.

On July 15 Henry M. Brinckerhoff, engineer and power expert, who had studied and reported to the P. R. T. on the physical features of the Conowingo plan, testified that the Philadelphia Electric Company would suffer an annual net loss of $1,113,360 through its contemplated operation of the combined hydro-electric and steam power plants along the Susquehanna River in Maryland. This figure was in contradiction to the $1,624,350 estimated annual saving through power development at Conowingo, offered by experts of the Philadelphia Electric Company. The witness pointed out two alleged errors in the electric company's computations:

First, the Philadelphia Electric Company estimate of $148 a kilowatt-hour for construction of steam plants was too high, as they could be built for $110 to $125 a kilowatt-hour.

Second, the varied flow of water in the Susquehanna River, across which the dam will be thrown, causes droughts and floods, which would prevent a continuous operation of the plant throughout the year.

Evidence offered by Mr. Brinckerhoff was substantiated by Colonel John P. Hogan, New York engineer, who testified that the over-all operation efficiency of the Conowingo plant, with the most consistent of river flow conditions prevailing, would be but 82.5 per cent, nearly 3 per cent less than the efficiency estimated by the Philadelphia Electric engineers, and insufficient to guarantee promoters of the enterprise a safe return on their investment.

Colonel Hogan named the factors which would prevent the operators from using 100 per cent of the water at Conowingo or from attaining perfect coordination between the operation of steam and water-power plants as follows:

Inability to predict the exact load to be expected on a large system on any day or at any hour of any day.

Frequent changes in methods of operation made necessary by fluctuations in flow of the stream.

Occurrence of sudden floods or freshets requiring quick change in methods of operation.

Maintenance of satisfactory electrical conditions on a large system.

Interruptions to service in the hydro-electric units, in the transmission line or in the distribution system of the company utilizing the water power, either due to accident or necessity for repair.

The tendency of the steam-electric plants to take on more than their share of the load.

Necessity of maintaining a minimum amount of steam in operation at all times for regulatory purposes.

Maintenance of economical steam-operating conditions.

Leakage through the dam or through the wheels not in operation.

Colonel Hogan also pointed out the danger connected with a possible interruption of service from Conowingo. The maximum capacity of the plant, he said, was estimated at 214,000 kw. Should this break down it would be necessary to have at least a similar amount of power in reserve from steam sources to prevent a shutdown. In the tentative set-up which Colonel Hogan said the P. E. engineers had furnished him, he had found only 36,000 kw. as the maximum steam reserve. Shutdown of the Conowingo plant, he said, might be caused by weather conditions affecting the transmission lines, ice jams in the river either above or below the plant or ice forming at the power house.

Under cross-examination by counsel for the electric company, Colonel Hogan said that interconnection with other power companies and the proposed electrification of railroads around Philadelphia might give a better reserve and permit of more economical operation by giving a market for surplus power.

John M. Schmunk, an accounting expert of Harrisburg, testified that analysis of the figures submitted to the commission by the Philadelphia Electric Company and records of the Maryland Public Service Commission proved the electric company would obtain a mere equity of $392,417 after purchasing for $1,170,000 the option held by Drexel & Company in properties involved in the steam-water power scheme and expending an additional $4,450,000, plus interest, in exercising that option. He further testified that the property for which the Philadelphia Electric Company was to pay $5,855,486 represented an investment of only $951,018. On cross-examination it developed that he had eliminated interest charges on mortgages of the property over a number of years. He also had eliminated the cost of taxes on the properties in these years and he refused to include the cost of engineering and legal work in connection with the developments of the lands for a power plant. The exclusion of these items accounted for the difference in figures.

In concluding the hearings the commission asked several questions about the financial features of the project and intimated that they would require certain revisions such as the elimination of the "coal clause," which would permit charging varying rates for the hydro-electric power as the price of coal changed. The commissions also inquired about paring the fees of the investment bankers who promoted the project and considered some action to bring the subsidiary company which owns the land in Pennsylvania under the control of the Maryland commission by extending its holdings into Maryland and extending the holdings of the Maryland subsidiary into Pennsylvania to place it under control of the Pennsylvania commission.

The commissions will consider the evidence submitted and will hold a joint meeting in the fall, probably in September, to give their final decision in the case.

Hudson River Regulating District Attacked

On the eve of the contemplated sale by the State Comptroller of $3,000,000 bonds for the Conklingville Dam project in the Sacandaga Valley in connection with the Hudson River Regulating District development, attorneys for the Fonda, Johnstown & Gloversville Railroad have instituted an action in the Supreme Court in Fulton County attacking the constitutionality of Article VII-A of the conservation law, which authorizes the creation of river-regulating districts, and charging a general conspiracy on the part of the chief beneficiaries under the proposed development.

The complaint alleges that under this article, in 1922, the Adirondack Power & Light Corporation, the International Paper Company, Finch, Pruyn & Company, Inc., the Union Bag & Paper Corporation, and the Indian River Company, including the General Electric Company and Elmer J. West, entered into an unlawful agreement to have prepared, executed and filed with the state water control commission a petition for the purpose of having created and to have established the Hudson River Regulating District, ostensibly for the purpose of controlling the flow of the river within the district, but in reality to construct and create the Conklingville Dam and Sacandaga Reservoir to impound water for power generation for private gain of the corporations named and also for the private gain of Henry Ford and son, the West Virginia Pulp & Paper Company, the Hudson Valley Railroad Company, the Wood Flong Corporation, United Paper Board Company, Adirondack Trust Company, trustee; Fort Miller Pulp & Paper Company, Moreai

Manufacturing Company, Warren Curtis Manufacturing Company and the estate of Warren Curtis.

The railroad company asserts that 8 miles of its track would be taken through the projected construction, and that the taking of this section of track for use in the dam and reservoir would be the equivalent to an abandonment of the plaintiff's railroad property in the section and impair its ability to perform as a common carrier of persons and property.

Ranulf Compton, secretary of the Hudson River Regulating District, in an interview regarding the action said:

"The summons and complaint served on the board speaks for itself and is the culmination of a threat that was made at the public hearing in December, 1923, by attorneys for the Fonda, Johnstown & Gloversville Railroad, that it would attempt to force the board to pay more than $1,000,000 for about 7 miles of its branch railroad. It may be said at the outset that this action on the part of the railroad company will have no permanent effect on the policy of the board. Let it be understood that this project was conceived more than twenty years ago by the state of New York and was first extensively investigated by the State Water Supply Commission in 1907, at the request of Governor Hughes.

"The board has set aside in its estimate something more than $2,300,000 for the acquisition of lands upon which to construct the Sacandaga Reservoir, and included an item of $400,000 for the relocation of the Fonda, Johnstown & Gloversville Railroad."

Former Governor Nathan L. Miller will represent the Hudson River Regulating District, according to members of the board.

Middle West Utilities Acquires Central Maine Power Co.

As foreshadowed in the ELECTRICAL WORLD of June 13, the Middle West Utilities Company of Chicago has announced the acquisition of the Central Maine Power Company. In connection with the recent purchase of the Vermont Hydro-Electric Corporation and the Twin States Gas & Electric Company, which has been under Insull ownership for some time, this most recent step will make the Insull interests one of the outstanding utility groups in New England. Active negotiations are said to be going on now for the purchase in the near future of the Manchester (N. H.) Traction, Light & Power Company.

The Central Maine Power Company has a valuation of approximately $30,000,000 and serves 193 communities in the Kennebec and Androscoggin valleys and vicinity, with a total of 54,000 electric and 5,000 gas customers. The company operates twenty-two hydro-electric and two steam plants generating more than 154,000,000 kw. and returning gross revenues of approximately $4,500,000 annually.

With the acquisition of the Central Maine Power Company the Middle West Utilities Company now furnishes utility service to 1,269 communities in eighteen states.

New York Edison Case Continued

Company Denies Mayor Hylan's Charge of Excessive Rates and Property Valuation

FURTHER hearings on the complaint of Mayor Hylan that the rates of the New York Edison Company were too high and that the valuation of the company's property is excessive were held before the Public Service Commission of New York this week. Mayor Hylan contends that the company really earned 14 per cent on its invested capital in 1922, and according to its own estimates earned 10.3 per cent in the same year. He wants the rate to the general consumer reduced from 7 cents per kilowatt-hour to 5 cents per kilowatt-hour, which would mean a reduction of about $2,400,000 in the annual gross revenue.

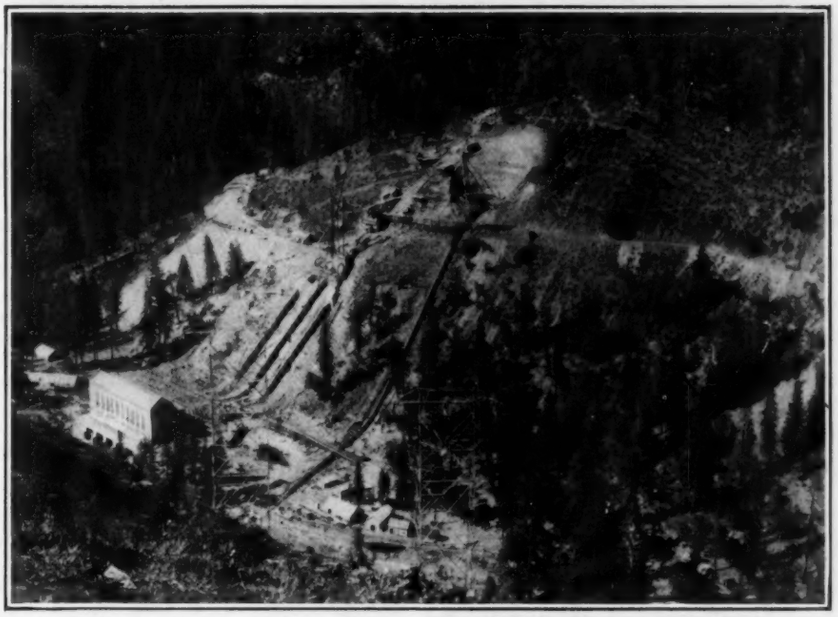
The company has introduced inventories and appraisals of its property which place the value of the company's various structures at $37,000,000 and its transmission and distribution system at $63,464,605, a total of $100,464,505. Francis Blossom, of Sanderson & Porter, engineers, submitted the property valuation, and Col. W. B. Jackson, rate engineer for the company, submitted the line valuation. These figures were accepted by the commission over the objections of the city counsel, who contended that on May 1, 1901, the company's property valuation did not exceed $23,089,781.84 and that additions since that time would not give the company's present estimate.

The city objected particularly to items listed as unfinished construction, claiming that this was of no service to the people, but Henry M. Edwards, vice-president of the company in charge of accounting, stated that no unfinished construction had been charged in the schedule unless it had been far enough advanced toward completion to enable its operation. The city also objected to an item of $1,600,000, representing deposits made with the company by customers, but Mr. Edwards said that this had always appeared among the company's resources. He further submitted books and statements showing that on December 31, 1924, the company's fixed capital, exclusive of good will and working capital, was $202,482,695 and that total resources were $282,657,380.

Hearings on the case have been adjourned until September 15.

Pit River No. 3 Placed in Operation

Pit River No. 3, the latest hydro-electric development of the Pacific Gas & Electric Company, was formally dedicated and placed in operation on July 18. The brief but fitting ceremony was witnessed by 250 editors of central and northern California, who were the guests of the company on a two-day excursion. The party traveled by special train from San Francisco to Mount Shasta and from there over the McCloud River Railroad and the company's private construction railroad to the plant. As previously reported in the ELECTRICAL WORLD, the Pit No. 3 plant is located on the Pit River, 11 miles below Pit No. 1 plant, which was placed in operation three years ago.



PIT RIVER NO. 3, THE LATEST HYDRO-ELECTRIC DEVELOPMENT OF THE PACIFIC GAS & ELECTRIC COMPANY

Pit No. 3 contains three 33,000-hp. vertical reaction turbines, operating under a head of 280 ft., direct-connected to three 27,000-kva. generators. Power is stepped up to 220,000 volts through three banks of 30,000-kva. transformers and is transmitted over an 8-mile extension to the original 220,000-volt transmission lines extending from Pit No. 1 to Vaca Dixon substation at the lower end of the Sacramento Valley, a distance of 200 miles. Pit No. 3 was started about two years ago and has been completed at a cost of $13,500,000.

North Central Meeting at Duluth

Record Attendance Present at Convention of Minnesota and North and South Dakota Electrical Men—Rural Electrification and Commercial Subjects Features of Program

THE sixth annual convention of the North Central Electric Association, which is a geographic division of the National Electric Light Association including Minnesota and North and South Dakota, was held in Duluth, Minn., on July 15-17. A record attendance was present to enjoy a program which emphasized the most recent developments in rural electrification and the commercial problems of the industry.

G. O. House of St. Paul, the retiring president of the association, in his opening address, voiced his belief that municipal ownership is becoming a thing of the past and that "the people of this country realize that its rapid progress to the greatest nation in the world has been due to individual initiative and ambition and energy and enterprise. They will never consent, in my judgment, to take the steps which lead to a communistic program."

James E. Davidson, president National Electric Light Association, spoke on public relations and dwelt particularly on the necessity of maintaining courteous daily service to customers. He stated that his program as president of the association would be merely carrying on in a more intensive manner the program of the National Electric Light Association during the past years and that he hoped particularly to increase the interest of the industry in obtaining new commercial business during the year, thereby lifting the household burdens of the nation.

Earl W. Hodges of Little Rock, Ark., completed the first morning session with a talk on the work of a public utility information committee.

Utility and Railway Relations Compared

J. C. Kennedy of Omaha, Neb., chief counsel for the Missouri Pacific Railroad and the Nebraska Power Company, in the afternoon session on July 16 surveyed the public relations of the railway companies during the past fifty years and compared them with the light and power companies. He said in part:

"There are manifest reasons why the electric industry need not pass through such a devastating experience. Fortunately for all concerned, and entirely unlike the railroads' experience, we started out under widespread and quite effective regulation. Hence, we have been forewarned and forearmed, or it might even be said that we have been protected against ourselves. But, especially in the light of what has gone before, it would be a poor compliment indeed to our observation and foresight if, irrespective of the regulatory laws, we did not conduct our affairs as to, at all times, merit the confidence and cordial co-operation of the people at large."

In the evening of July 16 motion pictures of the Red Wing experimental line, arranged by C. F. Stuart of the Northern States Power Company, were shown. The pictures showed the progress of the rural line in story form and brought out the difficulties being experienced in developing farm machinery for electric power.

On Friday morning Dr. E. A. White of Chicago, G. C. Neff of Milwaukee, Professor E. A. Stewart of the University of Minnesota, project director of the Red Wing line, and Professor H. M. Crothers of Brookings, S. D., consulting engineer of the Renner Rural Experiment line, gave addresses discussing all phases of farm electric service during a symposium on rural electrification.

Commercial Subjects Covered

During the convention many papers of particular interest to the commercial men present were read. Among the subjects discussed were "Servicing Appliances for Customers," by H. A. Dahl; "Theft of Current," by A. E. McMillan; "Commercial and Advertising Lighting," by Marston Curtiss; "Sign and Spectacular Lighting," by M. G. Braden; and "Latest Lamp Developments," by F. E. Doane, chief engineer of the National Lamp Works, Cleveland, Ohio.

C. P. Wagner of the Northern States Power Company presented an excellent paper on "Modern Street Lighting," which advocated the zoning of street lighting based on requirements of different districts with a standardized system selected for each classification. Discussion was led by O. F. Haas of the National Lamp Works, who urged that street-lighting systems should be planned far in advance. His talk is abstracted on page 163 of this issue.

The newly-elected officers of the association for the next year are as follows: President, C. S. Kennedy, vice-president of the Ottertail Power Company, Fergus Falls, Minn.; vice-presidents, C. J. Snyder of the Minnesota Power & Light Company and A. L. Kippels, Northern States Power Company; executive committee, W. A. Heald, Duluth; T. D. Crocker, Minneapolis; H. F. Thomas, St. Paul, and G. O. House, Northern States Power Company.

The entertainment program proved to be delightful, including a boat trip down the historic St. Louis River from Fond du Lac and a cruise on Lake Superior.

Expansion of Skagit Plant to 200,000 Hp. Recommended

J. D. Ross, superintendent of lighting, Seattle, in his annual report, recently issued, urges the expansion of the Skagit River hydro-electric power project to a point where the plant output would be 200,000 hp. He contends that the normal growth of the city light plant's business will warrant such an expansion and particularly emphasizes the need for the development of the Ruby Creek unit of the Skagit. The report states that a 200,000-hp. plant could be placed at Ruby Creek for $11,000,000 and could deliver power at the city limits at a cost of $55 per horsepower. This figure includes a railway from the present plant to Ruby Creek at a cost of $1,000,000, and an arch dam to be installed under the supervision of the federal government at a cost of $2,000,000. This dam would impound water for a plant of 175,000 hp. at Ruby Creek. This storage would not make the gorge unit less reliable but would permit the installation of the third 25,000-hp. generator in that plant, or even a 50,000-hp. generator if desired, as water will be available for that amount.

Applications to Cover Utah Plants to Be Filed

Applications for license are to be filed at once with the Federal Power Commission by the Utah Power Company covering the remainder of its plants on the Provo and Bear River and tributaries. A number of the existing plants of the Utah companies are technically in trespass on government lands, in that the authority that was granted a former owner could not be transferred legally.

Applications for license already are on file for some of the plants. Questions arose in the case of the remainder. Major Glenn E. Edgerton, chief engineer of the Federal Power Commission, has just returned from Utah, where he visited the plants. A complete understanding was reached and it is believed that the licenses for the plants will be issued promptly.

Application has been filed with the Federal Power Commission by the Green Bay & Mississippi Canal Company for authority to construct a hydro-electric power plant at Rapid Croche Dam, situated 4 miles below Kaukauna on the Fox River. The proposed plant will cost approximately $500,000 and will generate 3,800 hp. A transmission line will be built from this plant, tying it in with the company's Badger power plant at Kaukauna. When completed both these plants will be leased by Kaukauna under a long-term power contract, thus assuring the municipal light and power plant at Kaukauna of an adequate supply of power for all its customers which are now being partly supplied from current purchased of the Wisconsin Traction Light, Heat & Power Company at Appleton.

N. J. Norman of St. George, Fla., has applied for a preliminary permit covering a project in St. Marys River. It is planned to erect a dam which will provide a head of 11 ft. at a point 2 miles below the bridge of the Georgia Southern & Florida Railroad. The installation is to be 133 hp.

The commission on July 20 issued a preliminary permit to the Central Carolina Power Company of Columbia, S. C., covering a project in Broad River. It is proposed to erect a 32-ft. dam at Fort Shoals and a 34-ft. dam just above the mouth of Little River. Primary power to the extent of 12,800 hp. will be developed. It is planned to install equipment capable of generating 38,400 hp.

Briefer News

Adirondack Power & Light Corporation to Acquire Two Companies.—The Adirondack Power & Light Corporation has asked authority of the Public Service Commission of New York to acquire the Riddell Electric Light Company and the Hadley Light & Power Company. Myron B. Riddell, the principal owner of both companies, has testified that he favors the transaction on the ground the public would be better served by the Adirondack corporation. No opposition has developed.

Large Orders for Power from Grand Falls Received.—It is understood the New Brunswick Power Commission has received orders aggregating 71,000 hp. in connection with the power to be developed at Grand Falls. The initial development will be confined to from 50,000 to 60,000 hp., but plans are arranged so as to permit an increase of 25,000 hp. and ultimately 75,000 hp., making a final capacity of 150,000 hp.

Alabama Power Completes New Transmission Line.—Completion by the Alabama Power Company of a new 70-mile, 110,000-volt transmission line from Sheffield to Huntsville at a cost of $1,000,000 has been announced by Thomas W. Martin, president of the company. The line was placed in operation on July 13 and completes a power loop which will enable the cities of the Tennessee Valley to draw upon a supply of energy from any of the company's plants.

Doherty Acquires Missouri Utility.—Henry L. Doherty & Company have announced the acquisition of the Lawrence County Water, Light & Cold Storage Company, operating in several Missouri communities, including Aurora and Marionville, serving a total population estimated at about 12,000. The reproduction value of the property and business, with certain contemplated changes, is approximately $1,000,000. This company will continue, as heretofore, to be supplied with power by the Ozark Power & Water Company.

New 60,000-Hp. Steam Plant Planned in Louisiana.—According to a preliminary statement by A. E. Boger of Chicago, a company to be known as the Central Louisiana Light & Power Company will be formed in Delaware in the near future and will erect a 60,000-hp. steam-generating station on the Mermentau River, near Crowley, La. The power generated will be transmitted throughout southern Louisiana and will either be wholesaled to existing companies or distributed over systems to be acquired by the company. The plant as planned would cost about $10,000,000.

Oklahoma Town Votes Sale of Municipal Plant.—It has been announced that at the municipal election at Kiowa, Okla., July 14, the citizens voted 195 to 5 to sell their municipal light and power plant and distribution system and grant a twenty-five year franchise to the Southwest Power Company with headquarters at McAlester. The purchaser has a high transmission service line running within 2½ miles of Kiowa. A high line connection between the town and this line will be constructed immediately. The company will junk all existing equipment in Kiowa, including the distribution system, and install entire new construction.

Milwaukee Power Station to Be Enlarged.—The Milwaukee Electric Railway & Light Company has announced plans for the addition of a new 30,000-kw. unit to its Lakeside station near Milwaukee, Wis., the installation to be completed next spring. The extension will cost only $1,000,000, as boiler capacity has been provided for by previous construction. With the new unit in operation the capacity of the station will be 160,000 kw.

Recognition to Be Given for Meritorious Service.—The Samuel T. Bodine Meritorious Service Award, recently established and named after the president of the United Gas Improvement Company, will be given to employees of all public utility companies controlled or operated by the United Gas

SAMUEL T. BODINE

Improvement Company, for "extraordinary effort, without regard to self, toward maintaining uninterrupted service, or toward restoring interrupted service, or in some manner indicating exceptional fidelity to the public interest." Acts of heroism will be placed before the meritorious service board by the managing officers of the various companies. Two classes have been made of the cases to be honored: those which should be awarded medals and those which should receive honorable mention. A bronze medal, together with a certificate, suitably engraved, to set forth the reasons for the award, will be given. In case the act is qualified for honorable mention, a certificate, similarly engraved, will be awarded.

New England Lighting Experts Organize.—Leading central station illuminating engineers in the Northeast met recently and organized the Lighting Engineers Club of New England. The purpose of the new organization is to exchange experience and discuss lighting problems. Meetings will be held every six to eight weeks and in general the club will work along the lines of the similar association of central station power engineers in New England. At the meeting a talk was given by J. M. Hickerson, manager publicity department Miller Lamp Company, Meriden, Conn., on the forthcoming national industrial lighting campaign. The next meeting will be held at the Hotel Griswold, New London, Conn., during the fall convention of the New England division of the N.E.L.A. The chairman of the club is R. B. Brown of the Edison Electric Illuminating company of Boston.

Osage River to Be Dammed.—A contract now being negotiated by the Missouri Hydro-Electric Power Company calls for the damming of the Osage River near Bagnell, Mo. The lake which would be formed would cover 55,000 acres in four counties in the central Ozark Mountain region and would completely inundate Linn Creek, a town of 500 population, which is the county seat of Camden County. The cost of the project will be about $10,500,000.

New Jersey Forbids Utility Competition.—The Public Utility Commission of New Jersey on July 16 refused approval of a $35,000 stock issue of the Community Power & Light Company, which was to have financed the construction of a new transmission line. The commission said: "It appears that if the proposed line is built the petitioner must seek its customers largely from the same territory that is now being supplied by the New Jersey Power & Light Company." Experience has shown that competition among utilities is not for the best interests of the public. It is usually short-lived and results either in the failure of both utilities or their merger. If a lower price results it is merely temporary."

Virginia Plant Destroyed by Fire Second Time in Two Years.—The small generating plant at Louisa, Va., was destroyed by fire the second time in two years recently. The plant was operated by a gasoline engine, the backfire of which caused an explosion. One employee was killed and the total property loss is estimated at $100,000.

Commencement Date of New Ontario Power Development Uncertain.—The recent announcement by the Ontario Hydro-Electric Power Commission that a big power development scheme was to be undertaken in the vicinity of Ottawa, Canada, as reported in the ELECTRICAL WORLD of July 18, has given rise to considerable speculation as to when the actual work is likely to commence. Discussing the situation, Sir Adam Beck, chairman of the commission, said: "Now that the commission has received from the province the authority to proceed with the development, I believe the commission will endeavor as rapidly as possible to secure the co-operation of other interested parties to devise the ways and means of best developing the water powers that are available in order to meet the existing power shortage in the Ottawa and St. Lawrence districts." Sir Adam further stated that the commission was confronted with a great many difficulties associated with the in-

terests involved, and until these difficulties were overcome it would be impossible to even predict when arrangements could be consummated or work commenced.

Lincoln (Ill.) Plant to Change Hands.—It is reported that T. Ross, with several other Chicago men, has taken a thirty-day option on the property of the Lincoln (Ill.) Water & Light Corporation and that negotiations for the purchase of the $800,000 of outstanding common stock are now being made. It is understood that the purchasers are considering the acquisition of several other smaller plants in this territory.

Municipal Ownership Defeated in Sparta, Wis.—Municipal ownership and operation of the Northern States Power Company's electric properties by the city was defeated by Sparta residents at a special election on July 10, the vote being 1,140 to 200 in favor of continuing the operation of the properties under private ownership, although previous to this the people voted in favor of the city taking them over. The properties involved included a generating and distribution system valued at approximately $300,000. Knowledge that the purchase of the system would involve considerable litigation and expense caused the City Council to vote in favor of dropping all further proceedings in the matter. It was to uphold or reject the Council's action that this latest election was held.

Baker River Project to Be Completed in September.—The Puget Sound Light & Power Company has announced that the Baker River hydro-electric project, with an initial capacity of 40,000 hp., will be completed in September and that the new 31,500-kva. substation at Beverly Park, near Everett, Wash., will be completed at the same time. The substation will receive power from Baker River at 110,000 volts and will serve as a distribution center for all of the company's lines, including the new line between Everett and Seattle. The system it feeds now extends from British Columbia to the Columbia River and it can draw power from all of the company's stations.

Blairstown (N. J.) Plant Sold.—Plans have been completed by the New Jersey Power & Light Company, a subsidiary of the General Gas & Electric Corporation, to purchase the Blairstown Electric Light Company and operate it as part of its system serving northern and western New Jersey. The Blairstown system has been supplied for nearly thirty years by a hydro-electric plant built by the late John I. Blair and given to Blair Academy. This plant was outgrown by the increasing needs of the town and school. In order to get adequate service, the sale of the franchise to the New Jersey Power & Light Company was authorized at the recent annual meeting of the academy directors. A high-tension transmission line, to be built this summer from Columbia to Blairstown, will also make electric service available in Hainesburg, Walnut Valley, Vail, Jacksonburg and intervening territory.

Paper Company Forms Subsidiary to Develop Water Power.—The Pejepscot Paper Company of Maine last week filed articles of incorporation of the Androscoggin Water Power Company, to which it will transfer its water-power rights on the Androscoggin River. Julius Barnes, chairman of the board of the paper company, said in reference to the new company: "The growing development of New England industry, with its constantly enlarging need for power, has now reached the point where water power on regulated streams has assumed a new importance. These new phases, which require the development of potential power, the Pejepscot Paper Company feels, can be met more readily by its new subsidiary."

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

International Association of Municipal Electricians—Hotel Statler, Detroit, Aug. 17-20. W. R. Arbuckle, Bayonne, N. J.

Wisconsin Utilities Association, Electric Section—Green Bay, Wis., Sept. 4-5.

Camp Co-operation V (local leagues)—Association Island, Henderson Harbor, N. Y., Sept. 8-12. (Society for Electrical Development, New York, is sponsor.)

New England Division, N. E. L. A.—Hotel Griswold, New London, Conn., Sept. 8-11. Miss O. A. Bursiel, 149 Tremont St., Boston.

Society for Electrical Development—Henderson Harbor, N. Y., Sept. 8-12. S. E. D., 522 Fifth Ave., New York.

Pennsylvania State Association of Electrical Contractors and Dealers—Hotel Jermyn, Scranton, Sept. 10. M. G. Sellers, 1202 Locust St., Philadelphia.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 14-17. O. A. Weller, 900 15th St., Denver.

Association of Iron and Steel Electrical Engineers—Benjamin Franklin Hotel, Philadelphia, Sept. 14-19. John F. Kelly, Empire Bldg., Pittsburgh.

Southeastern Geographic Division, N. E. L. A.—Birmingham, Sept. 15-18. E. T. O'Connell, Alabama Power Co., Birmingham.

American Institute of Electrical Engineers, Pacific Coast Section—Seattle, Sept. 15-17. P. L. Hutchinson, 33 West 39th St., New York.

Great Lakes Geographic Division, N. E. L. A.—French Lick Springs, Ind., Sept. 23-26. R. V. Prather, 305 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden, Ind., Sept. 23-25. L. W. Davis, 15 W. 37th St., New York.

American Electrochemical Society—Chattanooga, Tenn., Sept. 24-26. Colin G. Fink, Columbia University, New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 1-2. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 5-9. J. W. Welsh, 292 Madison Ave., New York.

National Association of Railway and Utilities Commissioners—Washington, D. C., Oct. 13-16. J. B. Walker, 270 Madison Ave., New York.

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andrencetti, 413 C. & N. W. Terminal Station, Chicago.

Kansas Public Service Association—Topeka, Oct. 23-24. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Soviet to Spend $80,000,000 for Electrical Development Next Year.—A sum of 160,000,000 gold rubles, or approximately $80,000,000, is included in the budget of the Soviet Union for 1925-26 for the carrying out of an extensive plan for electrical development, according to K. P. Lovin, chairman, and B. A. Barsukov, manager of the technical department of the Moscow Combination of State Electrical Stations, who are in this country for a three months' study of power development and electrical machinery. The ultimate development for the Soviet Union will include thirty stations with a combined capacity of 1,750,000 kw.

Activity in Piedmont Section of Virginia.—Development of the electrical resources of the South Piedmont section of Virginia by interests reported as directed by Col. Ira Vaughn is being carried on rapidly. Local plants have been purchased at Brockneal, Chase City, Clarksville, Victoria, Emporia, Lawrenceville, Burkeville, South Boston and other smaller towns, and it is said that plans are being made to interconnect them with transmission lines and furnish power largely from two plants, one at Brockneal, where a large dam is to be constructed on the Staunton River, and another at Meherrin Falls. The object of the electrical development is understood to be to provide sufficient power to attract industries to the locality.

Opelika (Ala.) Will Not Sell Municipal Plant.—At a meeting of the City Council of Opelika on July 15 the proposal of the Alabama Power Company to buy the city light plant, all wiring and franchise for the sum of $120,000 was formally rejected. The city officials stated in their rejection that they considered the offer inadequate and insufficient, and announced their willingness to hear any further or more liberal offer that the company might see fit to make in the future. It is stated that the city's revenue from the plant is $16,000 annually and it is not willing to lose the revenue until it can be replaced, in spite of the offer to reduce rates and provide better service.

Raising of Fordyce Dam Progressing Rapidly.—The work of raising Lake Fordyce Dam by the Pacific Gas & Electric Company is progressing rapidly. It did not get under full swing again until the middle of June, late snowfall having delayed the resumption of construction. When the present work is completed the dam will be 116 ft. high and Lake Fordyce will have a storage capacity of more than 51,200 acre-ft. Its present capacity is 25,600 acre-ft. The additional water will be used to increase the capacity of the Spaulding-Drum power houses. Lake Fordyce Dam was originally built in 1873 to impound water for hydraulic mining. It has been raised three times.

Men of the Industry

O. C. Merrill, executive secretary of the Federal Power Commission, sailed July 17 from New York for London to attend the meeting on July 27 of the international executive committee of the World Power Conference.

A. E. Davidson, transmission engineer of the Hydro-Electric Power Commission of Ontario, Toronto, has been appointed representative for Canada at the high-tension conference in Paris. Mr. Davidson is now in Paris.

Grady Shipp, who has been secretary of the Chamber of Commerce at Duncan, Okla., has been appointed manager of the Duncan division of the Southwestern Light & Power Company to succeed R. W. McClure, recently transferred to Oklahoma City.

William E. Seaman, who was formerly connected with Stevens & Wood, Inc., as assistant designing engineer, is now affiliated with Henry L. Doherty & Company, New York, in the same capacity.

Edwin R. Martin, who for several years has been assistant professor of electric power engineering at the University of Minnesota, has resigned in order to take a position in the industrial power division of the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

J. H. Kuhlman has been promoted to the rank of assistant professor of electrical design at the University of Minnesota. Mr. Kuhlman is a graduate of the State University of Iowa. Following several years' experience in practical design with one of the electrical manufacturing companies, he served as an instructor in electrical design at the University of Minnesota.

W. E. Wood has resigned as president of the Southwestern Public Service Association because of his transfer, already noted in the ELECTRICAL WORLD, to Richmond, Va., to be vice-president and general manager of the Virginia Railway & Power Company. To fill out the unexpired term **Paul E. Nicholls,** president of the Galveston Gas Company, has been elected president of this association.

Owen D. Young, chairman of the board of directors of the General Electric Company, was recently presented with a decoration by the German Ambassador at a luncheon given at the Bankers' Club, New York. This honor was conferred on Mr. Young by the German Government in recognition of his services in connection with the reparations commission.

C. A. Wait, assistant to the president of the Illinois Power & Light Corporation, has been made manager of publicity for that corporation and all its subsidiaries in Illinois, Iowa, Missouri, Kansas and Oklahoma. Mr. Wait will continue also his duties as the president's assistant.

Leon T. Stone has been appointed district manager of the Southern California Edison Company in Tulare, succeeding **J. R. Haskin,** who has resigned as district manager and will be transferred to the company's general office in Los Angeles to assume important duties. Nineteen years ago Mr. Stone entered the service of the Edison company as office boy and messenger in the Los Angeles district and served successively as bookkeeper, statistician, chief clerk, traveling auditor, credit agent and now as district manager.

Ray Palmer Resigns

Ray Palmer, president and general manager of the New York & Queens Electric Light & Power Company, New York, has resigned to engage in consulting engineering with offices in New York and Chicago. Mr. Palmer has been prominently identified with the electrical industry for many years as a consulting engineer, as Commissioner of Gas and Electricity of Chicago and since 1915 as chief executive of the New York & Queens Company, which distributes electrical energy to 108 square miles of territory in New York

RAY PALMER

City. A native of Sparta, Wis., and a graduate of the University of Wisconsin in electrical engineering, Mr. Palmer entered the employ of J. G. White & Company in the capacity of assistant superintendent in the installation of substations and street lighting in New York City. The company then sent him abroad to serve on its engineering staff in London. After his return to the United States in 1904 he was appointed engineer for the Union Traction Company, Chicago, resigning in 1906 to establish an engineering practice in Chicago and Milwaukee. Then followed his occupancy of the office of Commissioner of Gas and Electricity of Chicago, in which he made many special reports on public improvements and completed what was termed at that time the most nearly perfect system of street lighting in the world. In addition he organized the Department of Gas and Electricity into separately working divisions—electric wiring and repairs, operation and maintenance, engineering and construction, lighting, fire alarm, police telegraph and electrical inspection—which resulted in a large saving to the city. In 1915 he resigned from public office to resume his consulting engineering practice. In the fall of that year he was chosen vice-president and general manager of the New York & Queens Electric Light & Power Company and within a short time was advanced to the presidency, from which office he has just resigned. Mr. Palmer will specialize in public works, valuations, reorganizations and other utility and industrial problems.

Mr. Palmer is a fellow of the American Institute of Electrical Engineers and a member of the Illuminating Engineering Society, the National Electric Light Association; the New York Electrical Society and the Engineers' Club of New York. He has always taken an active part in the Queensboro Chamber of Commerce and other civic organizations and during the World War was chairman of the committee on war industries, serving as regional commissioner for Queens on the War Industries Board.

H. B. Lucas has been appointed local manager of the new Auburn (Ky.) office recently opened by the Kentucky Utilities Company.

W. C. Walton, who has been in charge of the Lake Superior District Power Company's electric properties at Washburn, Wis, has been transferred to the company's Mellen (Wis.) properties.

T. V. Buckwalter, who has been chief engineer for the Timken Roller Bearing Company, was made vice-president in charge of engineering at the July meeting of the directors of the company.

R. W. McClure, who has been manager of the Southwestern Light & Power Company at Duncan, Okla., for several years, has been transferred to the general offices at Oklahoma City.

G. A. Donald has been selected as manager to take charge of the Lake Superior District Power Company's electric properties at Medford, succeeding C. S. Nason, who has been transferred to Ashland.

B. Nikiforoff has severed his connection with the General Electric Company to become chief electrical engineer for the Mexican Light & Power Company, Calle Gunte, Mexico.

J. B. Nayler, who has been identified with the engineering department of the Commonwealth Power Company, Jackson, Mich., has recently joined the Canadian Crocker-Wheeler Company, St. Catherines, Ont.

C. H. Dinsmore, who has been connected with the Wisconsin Power & Light Company's properties at Tomah, has been transferred to the Madison office to take charge of the industrial relations department of the company.

H. G. Butler, consulting engineer, formerly assistant chief engineer of the Railroad Commission of California and power administrator for the State of California, announces the formation of the partnership of Thompson & Butler for the general practice of engineering. Headquarters will be in San Francisco.

Russell Bowles, formerly manager of the Lake Superior District Power Company's properties at Mellen, Wis, has been transferred to Ironwood, Mich., to succeed as manager there A. J. Maloney

who has assumed new duties at Washburn, Wis.

G. Carl Kemper has just joined the advertising department of the W. N. Matthews Corporation of St. Louis, manufacturer of electrical specialties and mechanical painting equipment, as assistant to the general sales manager, who supervises the advertising activities of the company. Mr. Kemper is well known in advertising circles and was recently elected president of the Junior Advertising Club of St. Louis.

L. M. Williams has been appointed commercial manager of the Wisconsin Power & Light Company to succeed Orin Hofferbert, resigned.

John F. Maxwell, who was formerly associated with Stone & Webster, Inc., as electrical engineer, has affiliated himself with the Edison Electric Illuminating Company of Boston.

L. R. Janes, who has been associated with the Public Service Company of Northern Illinois since 1919, has been appointed development engineer of the company.

R. J. S. Pigott has severed his connection with Stevens & Wood, Inc., to become consulting mechanical engineer for the Public Service Production Company, Newark, N. J.

F. G. Barnett, formerly superintendent of transportation of the Public Service Company of Colorado, has been appointed manager of the Alamosa district to succeed A. Moriarity, recently transferred to Denver.

Robert M. Garth, formerly connected with the West Penn Power Company, Wilkinsburgh, Pa., has entered the service of the Knoxville (Tenn.) Power & Light Company.

Howard N. Snider, formerly associated with the Milwaukee Electric Railway & Light Company, has entered the engineering department of the Compania Cubana de Electricidad, Habana, Cuba.

A. J. Maloney, formerly manager of the Lake Superior District Power Company's properties at Ironwood, Mich., has been appointed manager at Washburn, Wis., to succeed W. C. Walton, recently transferred to Mellen, Wis.

James W. Dodge, formerly connected with the central-station engineering department of the General Electric Company at Boston, has recently joined the generating department of the Edison Electric Illuminating Company of Boston.

A. Moriarity, who has been manager of the Alamosa district of the Public Service Company of Colorado, has been appointed assistant superintendent of the company with headquarters at Denver.

G. E. McLean, formerly connected with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently entered the engineering department of the Commonwealth Power Corporation, Jackson, Mich.

C. H. Harris, who has been with the Mississippi River Power Company at the Keokuk power plant since 1912, has been transferred to Aurora, Ill., as electrical engineer of the Western United Corporation.

Dr. W. D. Coolidge, assistant director of the Research Laboratory of the General Electric Company, has been elected to life membership in the National Academy of Sciences in recognition of his development of the X-ray tube.

H. L. Snyder, formerly secretary and treasurer of the New York & Queens Electric Light & Power Company, has been made a vice-president and in that capacity will discharge the duties heretofore performed by Ray Palmer, president and general manager, who just resigned. **J. R. Malone** has been elected secretary and **Frank C. Gordon** treasurer of the company.

Leo D. Firman, formerly appraisal engineer for Stockwell, Wilson & Linvill, certified public accountants, has opened an office in Philadelphia, as a consulting electrical engineer.

H. A. Gould has recently joined the Pacific Gas & Electric Company of San Francisco, having severed his connection with the engineering department of the Southern California Edison Company.

H. A. Neil, formerly connected with the Niagara, Lockport & Ontario Power Company at Lyons, N. Y., has been appointed local manager of the Ware County Light & Power Company at Waycross, Ga., a Day & Zimmermann property.

Louis M. Meckler has resigned as distribution engineer for the Public Service Electric & Gas Company, Newark, N. J., to become sales engineer for the W. N. Matthews Corporation, New York City.

A. L. Forsyth, formerly connected with the electrical properties of the Wisconsin Public Service Corporation at Green Bay, has been selected to take charge of the properties at Wabeno recently purchased by the Wisconsin corporation.

Harvey P. Sleeper, formerly protection engineer for the Duquesne Light Company, Pittsburgh, is now associated with the Public Service Electric & Gas Company, Newark, N. J.

R. A. Haigh, formerly sales manager of the Haverhill (Mass.) Electric Company, has been transferred to Woonsocket, R. I., as sales manager of the Woonsocket division of the Blackstone Valley Gas & Electric Company.

George A. Clark, who has been connected with the Saginaw (Mich.) district of the Consumers Power Company since 1919, has been transferred to the engineering department of the Commonwealth Power Corporation at Jackson, which controls the Consumers Power organization.

A. F. Kirk, who has been connected with the engineering department of Stone & Webster, Inc., at Boston, has been transferred to the engineering department of the Blackstone Valley Gas & Electric Company.

David MacNaughton, who was local manager of the Interstate Public Service Company at Columbus, Ind., has recently severed his connection with that utility to join the Minnesota Power & Light Company, Duluth. Mr. MacNaughton will engage in power sales work.

K. C. Schluss, who has been connected with the Tacoma group of properties and the southwestern district of the Puget Sound Power & Light Company for twenty-three years, has been appointed general superintendent of the Western United Gas & Electric Company, a group of properties in Illinois, the management of which has recently been taken over by Stone & Webster. The Puget Sound company is also under the executive management of Stone & Webster.

Dean Howard McClenahan has resigned from the faculty of Princeton University to become secretary of the Franklin Institute, Philadelphia.

W. Earle Dye, for the past six years editor on the staff of the Richmond *Missourian,* has affiliated himself with the Missouri Gas & Electric Service Company to engage in advertising, publicity and electrical merchandising activities.

Loren Emery, formerly assistant merchandising manager of the International General Electric Company, has been made general merchandising manager of the company. **R. G. Henderson,** formerly general merchandising manager, has been detailed for special promotion work.

Robert A. Bachman, who served for eighteen years as vice-president and general manager of the Thomas A. Edison Company's Laboratories, Edison Storage Battery Company and the Edison Chemical Works of West Orange and Silver Lake, N. J., has been appointed general manager of the Blair Tool & Machine Corporation, New York.

A. W. McLimont, vice-president and general manager of the Winnipeg Electric Company and Manitoba Power Company, Ltd., has been elected a director of the Power Corporation of Canada, which recently purchased the interests of the Sir William Mackenzie estate in the Winnipeg Electric Company.

Robert Montgomery, manager of the investment department of the Louisville Gas & Electric Company, has been promoted to the position of manager of sales and publicity. The newly created office involves general supervision of the advertising, investment, commercial, service and complaint departments. Mr. Montgomery entered the public utility business at an early age and has been in various departments of gas and electric companies for twenty-five years.

Obituary

Louis F. Massa, vice-president of the A. D. Granger Company, manufacturer of power plant machinery, New York, died July 2 at the Englewood (N. J.) Hospital as a result of typhoid fever. Mr. Massa had been affiliated with the Granger Company since 1900. His early work was principally in connection with steam turbine development, but later he became identified with the electrical contracting business. Mr. Massa was a graduate of Columbia University in civil and electrical engineering and was fifty-six years of age.

Commission Rulings

Rates Regulated on Reasonable Ability of Consumers to Pay as Well as on Return to Company.—In establishing a rate base and schedule for the Weaverville Electric Company, the California Railroad Commission fixed the rates to yield a return of 7 per cent on the investment. The commission stated that it had held in a number of instances that 8 per cent was a reasonable return on the investment, but in this case it found that rates to yield 8 per cent were more than the consumers could reasonably be expected to pay, and it was of the opinion that the lower rate would prove more remunerative to the company over a period of time because of the increased consumption of energy which would be induced.

Maryland County Commissioners Cannot Bar Utilities from Their Districts.—Following a ruling given to the Maryland Public Service Commission at its request by the State Attorney-General, the commission, in granting the Consolidated Gas, Electric Light & Power Company of Baltimore permission to extend its power lines into Harford County, refused to admit that a protest from the County Commissioners or from local companies could operate as a barrier to the company's entering the county. The Attorney-General ruled that by the terms of an old charter granted to one of the constituent companies that now form the Consolidated the latter has the right to extend its lines into any county or municipality of the state despite objections from local authorities. Nearly every large utility company in the state is said to possess such a charter, which would give it similar freedom from interference by local authorities in making any extensions.

Utility Not Required to Render Service to Two Connected Buildings Through One Meter.—In the case of Aldis & Company vs. Commonwealth Edison Company the Illinois Commerce Commission upheld the refusal of the Commonwealth Edison Company to furnish service to two connected buildings through one meter on the ground that such action was not discriminating, and that if such service were permitted it would upset the company's rate structure. The commission said: "It is not alleged that these two buildings are owned by the same parties nor that they are occupied and used as a part of one business under one owner, but merely that one firm acts as the agent of the separate parties owning the two buildings in the subletting of space therein. . . . Should the practice contended for the complainant herein be extended to its logical conclusion, we would see all the buildings on one block, or possibly on several blocks, connected together by various means and the service for all these buildings furnished by the Commonwealth Edison Company, over one meter, to some form of organization which would redistribute the energy to the owners and occupants of the various premises. Upon inquiring into the effect of such an arrangement we find that it will ultimately result in the upsetting of the whole rate structure under which the service of the Edison Company is furnished. . . . Careful consideration of the probable result of this arrangement shows its unfeasibility. Aldis & Company are now the agents for both of these buildings and may in the future become agents for other buildings located near by. If this plea be granted, the future connection of other buildings to this same service connection must be allowed. Other parties now the agents for similar chains of buildings might acquire the agency for one of these buildings. This would necessitate its disconnection from Aldis & Company's common service and its connection to that of the other agency. After this plan has been in effect for some years there would exist a confused network of interconnections, crossing and recrossing each other as occasion demanded the disconnection of a building from one source of supply and its connection to some other."

Objection to Operation of New York State Utilities by Foreign Corporations.—The New York Public Service Commission in the cases of the Ridgefield Electric Company and the Morgan & Wyman Electric Light & Power Company disapproved the operation of local state utilities by a corporation organized outside of the state. In the case of the Ridgefield Electric Company this disapproval was given even though the foreign company had been operating the local company for several years without legal sanction and the decision might cause inconvenience to present consumers. In the second case the commission said that while it approved of combinations that effected efficiency and economy, no sufficient reasons had been offered why such a combination should be under the control of a foreign corporation.

Rural Electric Service Losses Considered in Rate Structure.—In authorizing a service charge plus a transformer charge for the Cambridge-Albion Electric Company, the Railroad Commission of Wisconsin described the additional expenses required to serve rural customers because of the distance between service installations, and further said: "A second characteristic of rural service is that of large distribution losses, resulting in part from the greater length of rural as compared with urban lines and in part from the larger number of transformers and consequently greater transformer losses. It is estimated that the total primary losses, transformer copper losses and secondary losses in rural service are of themselves equivalent to the total losses in urban service. This leaves transformer core losses as an excess loss in rural service. It may be somewhat surprising to rural customers to know that in many cases their transformer core losses, which are constant, irrespective of consumption, are actually greater than their consumption."

Recent Court Decisions

Telephone Lineman May Recover for Negligent Failure to Insulate Electric Wires.—In Hines vs. Consumer's Ice & Light Company the Supreme Court of Arkansas held that a power company was responsible for properly insulating its wires at points where there was any reasonable danger of men working on the poles coming in contact with them, and that a telephone lineman who was working on the power company's poles with the knowledge and consent of the power company was entitled to recover for any injury received from improperly insulated wires. It was said that the power company was not required to insulate all its wires, but since it knew and approved of his working on its poles the telephone lineman was not a trespasser or bare licensee and it was the duty of the power company to give him every protection in his work. One member of the court dissented from the opinion, maintaining that a licensee working on another's premises assumed all the dangers of such work. (272 S. W. 59.)*

Change in Number of Shares of Common Stock Not Within Jurisdiction of Maryland Commission.—The number of shares of common stock issued by a company was held to be without the jurisdiction of the Maryland Public Service Commission by the Court of Appeals of Maryland in Whitman et al. vs. Consolidated Gas, Electric Light & Power Company of Baltimore. The power company stockholders authorized the issue of four shares of no par value common stock for each share of $100 par value common stock outstanding, and the court held that this was in no way an illegal capitalization of surplus or undivided profits and that the Public Service Commission had no jurisdiction when the company's charter had been amended to authorize such issue, since it was purely a matter of internal regulation and did not affect the consumers or public. (129 A. 22.)*

Estimates of Commission Engineers Should Not Be Reduced Without Justification.—The United States Supreme Court, in reviewing Ohio Utilities Company vs. Ohio Public Utility Commission, appealed by the company from a decision against it in the Ohio Supreme Court, stated that the commission was not justified in arbitrarily reducing estimates of expense made by the commission engineers without evidence to warrant such reduction. The reductions in question were preliminary organization expense, interest for one year's construction period, working capital and actual operating expenses. In each case the Supreme Court found no evidence to show that the engineer's estimate had been excessive, or that the company's operation had been uneconomical. The judgment was therefore reversed. (266 U. S. 69.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Competition Must Be Met

Delayed Acknowledgment of Competition by Manufacturers Discourages Jobber—Price Wars Disastrous to Entire Trade

BY A JOBBER

WHILE the volume of business in electrical supplies continues fair, there is a general feeling among supply men that there is not enough business to go around and that the situation is one requiring courage on the part of both the jobber and the manufacturer. In addition, ill-considered interference by the manufacturer may bring on disastrous results to machinery of the trade.

Consider the case of a jobber who is giving support to a manufacturer's article that has maintained a fairly steady price but who is suddenly met with a situation created by another manufacturer entering the field and offering to sell direct and at a great reduction in price. For example, an item of a certain manufacturer was being sold at 30 cents and had been sold at that price for some time, consistent support having been given to distributing this article by the jobber. Then came an independent manufacturer selling direct in this jobber's field and offering the substantial equivalent of this article at 23 cents. This independent manufacturer secured in one week an order for 200,000 articles of this class. The jobber's manufacturer refused to consider the competition and at the same time criticised the jobber for not getting better and larger sales on this item. A little later, still more sales were made by the independent manufacturer at the low price and the manufacturer's jobber then realized that the situation was one not to be ignored and that if business was to be secured, price concessions would have to be made.

A WRONG POLICY

In the case in question the difference in price on the equivalent items at that time was 7 cents. Now, what did the manufacturer do? He made a cut of 5 cents. By this time a great volume of business was moving to the independent manufacturer and it was not to be expected by any one that this business could be checked by any price concession that was still higher than the price at which the material was moving. But worse than that, it became evident to the trade that this favored manufacturer could quote a lower price but had been unwilling to do so until forced to and was still asking more than the outside manufacturer. In a situation of this kind, the only thing the manufacturer should have done to give his jobber fair support was to have made a lower price of, say, 21 cents, blocked the effort of the independent manufacturer, demonstrated to the trade that he was in a position to meet all comers on the basis of quality and price, taken the business and then have been in a position to return to a stable market price, retaining the confidence and enthusiastic support of his jobber and the trade.

The situation as outlined has to do with the position of the manufacturer selling through his regular jobber. Consider now the case of the independent manufacturer attempting to sell direct in a territory already covered by other manufacturers' distributors. It is quite unfair, and dangerous as well, for manufacturers to enter a territory already covered by their jobbers and attempt to sell direct by means of price cutting.

The results of such actions are apt to be disastrous not only to the independent manufacturer but to the entire trade machinery of the community. In the case cited, the independent came off with the business in the first skirmish. Whether he made any money or not from the business is for him to decide, but had he been met by a courageous manufacturer he would have come off much the worse for the encounter and, more important still, he would not have demoralized the market and made it more difficult for every one in the community to do business at a fair profit.

A firm policy on the part of manufacturers having distribution in a given community would thwart the successful carrying on of any such actions as here outlined, but unfortunately many manufacturers having good distributing connections in many communities will try to break into other communities where they do not have distribution, by selling direct and at prices ruinous to profit and to the distributing organization within the community as well. If there are manufacturers who cannot be appealed to on the basis of fair play to refrain from unfair competition in communities in which they do not have regular distribution, it is then the responsibility of those manufacturers who will respect the rights of others to make a resolute, prompt and decisive effort to thwart the attempts of any manufacturer to disrupt the machinery of trade that has been set up through years of effort and that has demonstrated its value to both the producer and consumer.

Some Problems of the Sign Business

Early Popularity Followed by Inattention—Local Market Development Left Largely to Manufacturer—Load Deserves More Constructive Co-operation

BY JAMES M. GILCHRIST
Vice-President Federal Electric Company, Chicago

TWENTY to twenty-five years ago there was a great deal of enthusiasm in the electrical industry over the electric sign business. Central-station men were making a great effort to obtain more of it. Their commercial departments were active in the sale of signs, and as a result many companies built up a very fine sign load. Subsequently the electric light and power companies largely discontinued their sign activities, and the sign manufacturers were forced to build up their own sales organizations. Thus it became the practice, which has continued until recently, to depend upon the sign manufacturer to sell signs. "Leads" were turned over to the traveling salesmen of the sign manufacturer as they visited the city from time to time, and in sime cases some one from the commercial department of the central-station company was sent out to introduce the salesman. But the lighting companies as a whole got very much out of the habit of selling signs.

The nature of the business is such, however, that they would be justified in a considerable expenditure of time and money to develop it, and the interests of their customers would be much better served if they did so. For there is a large class of merchants who are so situated that about their only means of advertising is by signs on their places of business. The prosperity of such merchants is essential to the prosperity of the community, and it is both an opportunity and a duty of the central station to assist them.

DIVERTED BY MERCHANDISING

Another factor in the situation is that in the past five or six years there has been a great deal more attention devoted to merchandising and many utilities have established merchandising departments. The sale of electric signs has been turned over to the merchandising department. Unfortunately for the sign manufacturers, the primary interest of this department is profit on sales and not an increased station load, and from this viewpoint the sale of electric signs is not comparable with the sale of miscellaneous appliances. The sale of appliances requires carrying a stock and the establishment of sales and showrooms, with the result that a considerable margin is required to cover the cost of handling. The sale of electric signs, on the other hand, is a brokerage business and one which does not justify a large margin. There is no stock carried nor is any expensive salesroom required to carry on the business. The small margin, however, makes it ap-

pear unattractive to the merchandising department, with the result that this department gives it little attention. At the same time, the sale of electric signs requires a continuous effort which the commercial department, with its regular force of solicitors upon the streets, is in position to give and which the merchandising department cannot give so well.

Only a small proportion of the signs sold are sold on a first or second visit. Many who can use electrical advertising to great advantage have to be convinced that they need it. If the lighting company depends upon the occasional visits of the salesmen of the manufacturer, this educational work is not carried on. The salesman seeks the ones who he considers offer prospects for an immediate sale, canvasses them and passes on, leaving a large field entirely uncultivated.

The reason for this situation is obvious. The sign manufacturer, having no interest other than the profit in the immediate sale, cannot afford to carry on an educational propaganda. His margin is not large, his selling costs are high, and his salesmen must "skim the cream" from a large territory rather than work a smaller one intensively.

The lighting company is in a different situation. It has a corps of men on the street constantly and it can, at a moderate cost, carry on an extensive educational and development program which in the end will get a very much larger volume of business than can possibly be obtained if the selling is left to the salesmen of the various sign manufacturers.

Commission Evil

Another unwise and short-sighted practice that has sprung up as a result of the keen competition between sign manufacturers is the payment of commissions to lighting companies by the various sign companies. These commisions are paid upon the theory that the manufacturer gets the assistance or possibly the exclusive support of the utility, but the thing generally resolves itself into the payment of tribute for the privilege of soliciting in the territory, and the result of this arrangement is that either the manufacturer adds the commission to the cost and thus gives the customer less for his money or else his already small margin is still further reduced and he has less money available for selling expense and, therefore, further restricts his efforts.

Although it is the general practice among sign manufacturers to extend the terms of payment for various periods up to twelve months, very few of the lighting companies which sell signs make it a practice to extend deferred payments. There is a small class of retail merchants who are able to pay cash for signs, but there is a very large body who are doing a fair business, whose reputation is good and who are able to meet their current obligations readily, but who have not sufficient capital to buy a sign on a cash basis. Hence these merchants put off the purchase from time to time, the lighting company losing the load and the merchant losing the value of the advertising. While the sign manufacturer is not justified in extending terms more than one year, both because of credit considerations and because of the cost of collection, the lighting company is bound by no such restrictions. It is in close touch with its customers, it is very well acquainted with their responsibility and habits, and it is collecting from them every month, so that there is no additional cost involved in collecting a deferred account.

Term Selling

Selling over a period of twelve months is of great assistance, but the amount of sign business that can be obtained will be very greatly increased if payments can be spread over periods of three to five years. If a sign is sold with a suitable service arrangement included in the price, there is very little danger in selling signs over periods of three to five years and the amount of business that can be had will be multiplied many times. Every lighting company should have some arrangement for servicing the electric signs of its customers. This should either be a direct service performed by the lighting company or it should be an arrangement with a contractor to maintain such service. No electric sign gives its maximum advertising value unless it is clean and bright and has all of its lamps burning.

In taking up the sale of electric signs through its commercial department it seems most logical that the lighting company should work exclusively with some selected sign manufacturer. This arrangement assures the manufacturer sufficient business to justify him in furnishing the necessary assistance in the matter of education of salesmen, securing proper advertising lists and planning advertising campaigns, and handling only one make of sign makes it possible to educate the salesmen of the lighting company so that they can, unassisted, intelligently quote prices for signs and develop the business.

The Associated Advertising Clubs estimated that in 1923 about $15,000,000, or approximately one-quarter of 1 per cent of the year's advertising expenditures in the United States, was expended for electrical advertising. Electrical advertising has so much merit that it should get at least 1 per cent of the advertising appropriation of the nation, or $60,000,000. Figuring that one-half of the people live where electrical energy is available, this means that electrical advertising now amounts to 25 cents per inhabitant per year, while the goal that might be reasonably expected would be $1 per inhabitant per year.

These are some of the problems of the sign business, and in my belief, in view of the possible load and market involved, they deserve the serious consideration of the electrical industry. Electric sign manufacturers themselves have not effected the practical basis of co-ordination that should be the first step toward the rejuvenation of the sign business in scale with its opportunities, but there is now a prospect of this basis being reached, and meanwhile the business grows. A more general recognition of some of the impeding factors would, none the less, be helpful.

Business Conditions

MANUFACTURERS state that business is holding up well and that the slump noticeable at this period last year is not now in evidence. In addition, better business is being anticipated this fall. One central-station company placed orders this week for distribution equipment amounting to about $650,000 and another company placed a large order for lead-covered paper cable. Building construction continues at record levels and presages good purchasing of that class of material for the rest of the year. The Western Electric Company reports that orders received during the first six months of 1925 amounted to $147,670,000, and compares with $158,213,000 for the same period in 1924. This falling off in orders was anticipated by this company earlier in the year, when it stated in its report that the extraordinary demand for telephone equipment during 1924 was expected to return to normal levels.

In New England industrial heating equipment is in active demand, small motors are selling steadily, and there is a strong interest in electric welding apparatus. The outlook for the latter half of this year is very encouraging in that district. Some large orders covering distribution apparatus were placed in the New York district by one central-station company, business shows no tendency of slumping at this period, and an early noticeable demand for commercial and industrial lighting equipment continues strong. In the Southeast the letting of contracts by industrial plants for electrical installation projects has resulted in the placing of several satisfactory orders for wiring materials and devices. The drought in that district has curtailed water power so that stand-by steam-power stations are operating to capacity, but there has yet been no serious curtailment of service. The volume of business in the Middle West is quite satisfactory, but is somewhat spotty. Central-station expansion continues and building construction is active in that territory. On the Pacific Coast several good orders were placed by power companies, especially, for pole-line hardware and tools. Motor sales are also very good in that section, and general conditions have improved.

Building Construction Continues in Large Volume

JUNE was another month of enormous building volume, according to the F. W. Dodge Corporation. Contracts awarded in the 36 Eastern states (which include about ¾ of the total construction volume of the country) amounted to $540,609,600. This was only $7,000,000 less than the highest

record figure, which was reached last April. The increase over May was 9 per cent, and over June of last year, nearly 40 per cent. It is rather unusual for the June building volume to exceed that of May. June building contracts in Texas (which is not included in the 36 Eastern states) amounted to $20,442,200.

Each month of the past quarter has had a larger building total than that of any month previous to April. The first quarter of 1925 increased $44,000,000 over the first quarter of 1924; the second quarter of this year increased $294,000,000 over the second quarter of last year. The total increase during the past six months has been over $338,000,000, which is nearly 15 per cent. This increase has brought the total construction of the first half of 1925 up to $2,660,173,700.

The *Engineering News-Record* in referring to the general conditions in the construction industry says that the cost situation is very favorable to the awarding of new projects. Since May, 1924, the trend has been gently downward owing to falling prices. During this period the total decline was 9.2 per cent, with no change whatever in June, 1925. This amounts to a comparative stabilization, which is what the industry needed most. The extraordinary volume of contracts is the response. The labor situation also is in a much more satisfactory condition than in previous years. There have been fewer strikes. Wages, except those of common labor, have increased slightly, but increased efficiency has seemed to offset this.

Delinquent Electrical Accounts Increase in Average Amount

COMPARING May with the preceding month, there was a good decrease in the number of accounts in the New York and Philadelphia districts, as reported to the National Electrical Credit Association, but the average amount in each case showed a large increase. In New England the number of accounts was about the same as in the preceding month, but the total amount and the average amount increased about 25 per cent. In the Central Division the number of accounts and the average amount increased, but on the Pacific Coast, while there was a large increase in the number of accounts, the average amount decreased about 7 per cent.

As compared with the same month last year, the number of accounts increased in the Central Division and New England but showed a decrease for all other divisions. The average amount increased for all sections except the Pacific Coast.

DELINQUENT ACCOUNTS IN MAY

Branch and Month	Number of Accounts Reported	Total Amount	Average Amount
Central Division:			
April, 1924	871	$110,326.40	$135.04
April, 1925	964	107,660.66	111.68
May, 1924	957	110,184.35	115.13
May, 1925	1066	125,851.18	118.06
New York:			
April, 1924	471	64,648.00	138.00
April, 1925	554	66,989.00	120.00
May, 1924	366	51,725.00	141.00
May, 1925	338	55,157.00	163.00
Philadelphia:			
April, 1924	221	25,313.95	114.54
April, 1925	298	30,265.58	101.56
May, 1924	327	32,961.99	100.80
May, 1925	227	32,736.17	144.21
New England:			
April, 1924	35	4,442.94	126.94
April, 1925	118	10,466.92	88.70
May, 1924	70	6,883.85	98.34
May, 1925	116	12,981.98	111.91
Pacific Coast:			
April, 1924	31	3,869.93	124.84
April, 1925	19	1,570.74	82.67
May, 1924	28	3,180.00	113.57
May, 1925	27	2,101.04	77.82

Prices of Non-Ferrous Metals Advance—Market Quieter

PRICES of copper, lead, zinc and tin are all higher than a week ago, though the demand has materially diminished. Most producers are well sold up and believe that fundamental conditions are so good that higher price levels are to be expected. Practically all the copper sold to the usual delivery points in the East since last week Wednesday has been booked at 14⅜ cents, though the price now is much firmer at that level than it was last week Thursday. At that time, some metal was offered at 14.275 cents delivered in Connecticut, and as late as Friday, some spot metal was actually sold as low as 14¼ cents. In the last day or two some sellers have practically withdrawn from the market owing to their recent heavy business, and have been quoting 14½ cents delivered, Connecticut. No sales have so far been reported at that level, however, as several producers are still willing to book orders at the 14⅜-cent level. The total volume of business for the week ending July 22 has been slightly less than half that of each of the two weeks immediately preceding.

NEW YORK METAL MARKET PRICES

	July 15, 1925 Cents per Pound	July 22, 1925 Cents per Pound
Copper, electrolytic	14.27½	14⅜
Lead, Am. S. & R. price	8	8.20
Antimony	19½	16½
Nickel, ingot	34	34
Zinc, spot	7.52½	7.70
Tin, Straits	58	58¾
Aluminum, 99 per cent	28	28

Base copper price July 22, 1925, 16½ cents.

The contract price for New York lead set by the American Smelting & Refining Company was advanced from 8 cents to 8.10 cents on Monday, July 20, and to 8.20 cents on Tuesday, July 21. The two advances came as a surprise to the trade, as by Monday the premium prices that had been quoted in the outside market the week before had become only nominal, and the demand had quieted down very decidedly.

Wiring Materials and Devices Active in the Southeast

SEVERAL very satisfactory orders for wiring materials and devices have been received from contractors in the Southeastern district as a result of the letting of contracts by industrial plants for electrical installation projects. Small contractors in north Georgia are not purchasing up to their usual volume, but contracting activities in south Georgia are better than for some time past. Building contracts awarded in the nine Southeastern states during June amounted to $74,265,800, which represents an increase of 32 per cent over June, 1924, and as a result of these building activities all jobbers report excellent orders for all lines of construction materials.

The unusual drought prevalent throughout the section continues, with a consequent water shortage at the plants of the Southeastern power companies, all of which are operating available steam plants to capacity, but as yet there has been no serious curtailment of service to industrial plants. Lack of rain is also affecting crop conditions, and serious damage is sure to result unless relief is experienced in the near future. Electrical retail business shows some improvement over the past few weeks, though jobbers report continued spotty conditions. Extremely hot weather has served to assist in making this the busiest fan season on record. The sales of this item have in many instances more than offset the sluggishness that exists in certain other lines. Socket appliances and household devices are showing little activity at this time except that reported by central-station companies. Vacuum cleaner sales fell off sharply during June except in Florida, where the demand is sustained but no increases are reported. However, this lull is usual for this season and the fall outlook is fine.

Several Good Orders Placed on Pacific Coast—Sales Improve

MANY orders for pole-line hardware have been placed by power companies on the Pacific Coast. One company alone has probably purchased 20,000 pieces during the past week. Many requisitions for construction tools have also been made. The Pescadero district, 50 miles south of San Francisco Bay, has just been reached by two power companies and has immediately furnished a fine motor and wiring supply business. Motor sales are very good, especially in the 10-hp. and 15-hp. sizes. This is partially explained by the completion of delayed construction in rural communities through improved business conditions. Coast stocks are entirely adequate to meet present demands.

All lines are moving well, particularly externally operated knife switches, reflectors and renewable fuses. Dealers' orders from interior cities have shown a seasonal decline. The Southern Pacific Railroad has renewed its lamp contract, amounting to $100,000. Washer and vacuum cleaner sales are fair and the range campaign is gathering momentum. Bare copper and rubber-covered wire prices have advanced with practically no immediate sales, and while factory prices are steadier local prices are reported to have decreased owing to keen competition, especially certain schedule material. Orders placed in the Seattle territory included one for approximately $20,000 worth of cable terminals and splicing materials for the municipal street railway department. The city of Tacoma, Wash., also awarded a contract for $14,000 for furnishing and installing a carrier-current communication system between the Tacoma substation and the Lake Cushman municipal light and power project.

Business in the Middle West
Spotty, but Volume Satisfactory

THE volume of business in the Middle West is quite satisfactory, but is somewhat spotty. Certain lines of industry are unusually active, while other industrial companies are operating on shorter schedules. Central-station expansion continues along the definite plans made earlier in the year, and building construction is active. An interesting order for 100,000 ft. of 600,000-circ.mil, 132,000-volt, paper-and-lead oil-filled cable was received by one manufacturer this week. Maintenance purchases of the various utility companies have been quite heavy and tend to increase the volume of business. There has been a steady demand for poles, pole-line hardware, circuit breakers and meters.

Jobbers report a generally satisfactory week, in most cases. Active campaigns, combined with the hot weather, have resulted in volume sales of electric irons and fans. There has been a good demand for hotel and bakery electrical equipment, with numerous sales of larger apparatus to restaurants. Prices generally remain firm, with an upward tendency. The base price of copper advanced twice during the week and competitive sizes of wire and cable advanced 10 per cent this week. Due to a somewhat unsettled condition in Chicago, manufacturers of conduit who heretofore maintained warehouses are giving up this practice and will sell conduit to distributors only in carloads.

Industrial Heating Equipment
Active in New England

REPORTED sales of industrial electric heating furnaces in the New England district for the past week reflected an increasing interest among industries for this particular type of electrical equipment. One manufacturer records sales of six heating furnaces, ranging in capacities from 15 kw. to 75 kw., for plants in Hartford, Conn., Springfield, Conn., and Rochester, N. Y., and another reports a steady volume of inquiries and a strong trend in the buying of this product. Other lines of industrial equipment are reported quite active. Small motors are in steady demand with a tendency toward group orders; one manufacturer reports an order comprising 100 motors of small horsepower and amounting to about $9,000 for a New Bedford textile mill and another for twenty motors for a similar plant at Salem. Also, electric welding apparatus commands surprisingly strong interest from industries and automotive repair plants.

The demand for central-station supplies appears to be slackening, though the movement is in fair volume owing to late spring orders. New orders for poles, wire and general hardware are declining, though one manufacturer reports a slight flurry in the sales of steel transmission line poles. Household appliances are in less demand and jobbers report a decline in orders; on the other hand, one manufacturer reports a strong wave of interest in electric irons of the thermostatic control type and points out that the present production of this type fails to meet the current demand in this district.

The first half of the current year has been marked with a healthy upward trend in electrical equipment sales; the latter half gives promise of further encouragement. The rubber industry is resuming under full capacity; tool making and machine work continue on an even level and the textile industries give indications of normal operations at an early date. Building contracts are moving along with strong activity, especially in the erection of residential types and mercantile projects of considerable size are. pending. About $500,000 will be expended in electrical equipment and waterwheels in New England during the coming fall for hydro-electric development.

Large Orders Placed in New York District—Lighting Active

ORDERS were placed by a central-station company in the New York district for distribution equipment totaling about $650,000. Some smaller orders covering switches and other equipment were also reported. These orders cover part of the equipment for which negotiations were reported as under way in last week's ELECTRICAL WORLD. Manufacturers state that sales are holding up well when compared with a year ago and there are no evidences of a slump. Better business is also anticipated this fall. The demand for general purpose motors is considered fair, and as expressed by one company there is a steady stream of small orders.

Sales of various commodities so far in July do not compare favorably with June owing to the enormous demand for fans during the latter month. There is keen competition in the wiring device field, with much price cutting in evidence. A fairly good demand for control equipment is reported. Appliances are moving slowly with the exception of irons. Quite an activity is noticed in the commercial and industrial lighting field for this period of the year, the tendency being to anticipate requirements for this material. The prices of the competitive sizes of rubber-covered wire have again increased this week and competition remains especially keen in this commodity.

Activities of the Trade

Western Electric Company Orders Show Decrease

The Western Electric Company reports that orders received during the first six months of 1925 amounted to $147,670,000. For the quarter ended June 30 the total of orders received was $76,417,000, and compares with $71,253,000 for the first quarter of 1925 and $77,622,000 in the second quarter of 1924. The orders received during the first quarter of 1924 were $80,591,000. Orders received during the first six months of 1924 were thus $158,213,000. The decrease in orders received during the first six months of 1925 as compared with the same period in 1924 was anticipated by the company. In the previous report, issued at the end of the first quarter, it was then stated that the extraordinary demand for telephone equipment was expected to fall off to more normal levels.

Lincoln Electric Extending Distribution Facilities

The Lincoln Electric Company, Cleveland, announces the appointment of Whitman & Brandt, Atlanta, Ga., as distributors for "Stable-Arc" welders and "Linc-Weld" motors for the state of Georgia. A stock of Lincoln products will be carried to provide prompt service to the trade. The Lincoln company also announces the appointment of the Clyde Equipment Company as distributor in the states of Washington, Oregon and Idaho. That company maintains direct offices at Seattle and Portland and will carry a full stock of Lincoln products at all times.

In announcing the new distributor, J. F. Lincoln, vice-president of the Lincoln Electric Company, states that the company is steadily developing its plan whereby Lincoln equipment can be bought at any point in the United States from distributors without delay.

Detroit Rock Salt Company to Be Electrified

Plans have been formulated for the electrification of the Detroit Rock Salt Company, Detroit, Mich. Electric motors and control will be used in both the mine and the mill. The application of electricity to this mine follows the general policy recently established by the International Salt Company, which is gradually electrifying its various subplants, one of which, the Retsof Salt Company, was completed two or three years ago.

The apparatus furnished will include a 600-hp. induction motor and nine induction motors, ranging in size from 5 hp. to 75 hp. The complete electrical equipment, including the necessary switchboard, will be furnished by the General Electric Company. Much of the control will be arranged for remote operation, and all control devices will be immersed in oil, this being necessary as a result of the very high corrosive action of the salt dust suspended in the air.

Credit Interchange Bureau to Be Established in New York

At a meeting of the board of directors of the New York Electrical Credit Association, 261 Broadway, New York, held in New York City on July 16, a plan submitted by the service improvement committee was adopted, establishing a Credit Interchange Bureau as a supplemental service, effective August 1, 1925. The facilities of the association will be used in connection with this ad-

ditional service, and everything is said to be ready to start the new bureau promptly.

With the installation of the bureau by the association, it brings about uniformity and co-ordination between the local associations, located in Boston, Philadelphia, Chicago, San Francisco and New York, and affiliated with the National Electrical Credit Association. The publicity committee is now preparing literature to be sent to all members, explaining in detail the operation of the new bureau.

American Metallurgical Furnace Sales Show Striking Increase

Total sales of electric furnaces and allied industrial electric heating equipment by the American Metallurgical Corporation, Boston, thus far this year exceed the total business of the company in 1924. To a representative of the ELECTRICAL WORLD President K. A. Juthe stated that the outlook for industrial furnaces is exceptionally fine, that collections are excellent and deliveries thoroughly satisfactory.

Among the recent orders taken are the following: Two 30-kw. cyanide pot furnaces for the New Britain (Conn.) Machine Company; several special furnaces of about 60 kw. to the Union Hardware Company, Torrington, Conn.; a 75-kw. box-type carburizing furnace to the Norton Company, Worcester, Mass.; a 20-kw. cyanide pot furnace to the Cushman Chuck Company, Hartford, Conn.; a 15-kw. lead pot furnace to the Arrow Electric Company, Hartford, Conn.; a 30-kw. box-type carburizing and hardening furnace and a 20-kw. cyanide pot furnace to the Perkins Appliance Company, Springfield, Mass., and a 30-kw. continuous double-door furnace for annealing go'd wire to the Shur-on Optical Company, Rochester, N. Y. Mr. Juthe states that many repeat orders for units larger than the original are being booked in the Eastern industrial field and development work is also very active.

The Commercial Truck Company, 300 Hunting Park Avenue, Philadelphia, announces the opening of a factory branch in the Boston territory with headquarters in the Transit Building. F. K. Perkins, formerly attached to the New York sales office of the company, will be in charge of the new Boston office. Associated with Mr. Perkins will be Wendell P. Smith and D. H. Queeney, Jr. Mr. Queeney was formerly the company's service manager in the Hartford territory and will act in a similar capacity in Boston.

The General Electric Company has plans under way for further additions to its local plant at Sixty-ninth Street and Elmwood Avenue, Philadelphia, estimated to cost in excess of $250,000.

McClellan & Junkersfeld, Inc., engineer and constructor, with offices at New York, St. Louis and Washington, D. C., is now represented in Chicago by Stephen Gardner, as district manager, with offices at 203 South Dearborn Street. Mr. Gardner will also continue as president of the Industrial Engineering and Sales Service, Inc., of Chicago.

The Brown-Brockmeyer Company, Dayton, Ohio, recently organized by Edgar W. Brockmeyer and associates, will acquire a local site and erect a plant for the manufacture of small electric motors.

The Western Electric Company, Hawthorne, Ill., has plans under way for extensions in the cable-manufacturing division at its local works, to increase the present output approximately 25 per cent. Considerable additional equipment will be installed, estimated to cost about $400,000. It is expected to have the expansion completed early in the coming year.

The R. Thomas & Sons Company, East Liverpool, Ohio, manufacturer of high-tension porcelain insulators, announces that it has secured the services of H. B. Vincent, who for many years past was associated with Day & Zimmermann, Inc., Philadelphia, as engineer of construction and operation. Mr. Vincent will be assigned to the field engineering service department and will personally direct the activities of field engineers who work with the operating companies on insulator and general construction problems.

Victor Hybinette, Wilmington, Del., manufacturer of "Hybnickel" alloy products, announces that Arlington Bensel has taken over the exclusive sales agency for his products with an office at 300 Madison Avenue, New York. For the last twenty years Mr. Bensel has been vice-president and sales manager of Driver-Harris Company.

The Chicago Fuse Manufacturing Company, Laflin and Fifteenth Streets, Chicago, has placed on the market new "Gem" sectional switch boxes that are said to save installation time.

The Dust Conveyor & Recovery Company, East 116th Street and Erie Railroad, Cleveland, has started construction work on a new factory building to cost $100,000.

New Equipment Available

Measuring Instrument

For testing batteries, in checking voltage, in measuring insulation, in making load tests, in measuring resistance and for various other tests an instrument known as the "Avo" tester, which is shown in the illustration, has been placed on the market by the Electrical Engineering Service, 40 Rector Street, New York. Amperes, volts or ohms can all be measured by this instrument, which is only 7 in. x 3 in. x 1¾ in., and is accurate enough for the majority of tests. A 10-amp. shunt is furnished with the tester and other shunts can be supplied.

THE "AVO" TESTER—A COMBINED VOLTMETER, AMMETER AND OHMMETER

An ordinary flat flashlight battery of commercial 4½-volt size is held in place in the instrument by an easily removable spring. For voltage readings on batteries series resistances are built into the case. All parts of the tester are said to be easily accessible for repairs.

Oil Purifier

An equipment for the purification of badly-carbonized switch oils or sludged transformer oils has been placed on the market by the Sharples Specialty Company, Twenty-third and Westmoreland Streets, Philadelphia. The process used is a chemical-centrifugal one and utilizes two "Sharples Super Centrifuge" machines in addition to the tanks in which the chemical treatment takes place. Each of these centrifugal machines can also be used independently for the dehydration of transformer oils when not in use in the chemical-centrifugal process.

Measuring Instrument

A five-element meter with a maximum demand indicator has been placed on the market by Landis & Gyr, Ltd., of Zug, Switzerland, through its agents, L. H. Junod & Company, 104 Fifth Avenue, New York. As an illustration this meter has been used to measure and record on one register the consumption of a three-phase, three-wire circuit of 500 volts, 50 cycles with unbalanced loads of 100 amp., and a three-phase, four-wire circuit of 260/145 volts, 50 cycles with unbalanced loads of 20 amp. In addition the total maximum demand of these two circuits is recorded on the maximum demand scale at a fifteen-minute interval.

Either a cyclometer-dial register or a four-dial pointer register can be supplied if desired. The demand register can also be supplied for any other demand interval in practice. This same type of meter could be calibrated for other combinations; for instance, it could be constructed to measure five independent single-phase circuits.

New Trade Literature

LUBRICATION OF BALL BEARINGS.—A booklet has been issued by the Standard Steel and Bearings, Inc., Plainville, Conn., entitled "Lubrication of Ball Bearings Applied to Electric Motors," in which it describes and illustrates the correct lubrication of ball bearings. A choice of lubricants and a lubrication chart for bearings equipped with oil-tight housings (oil bath) is included.

INSULATING VARNISHES AND COMPOUNDS.—The Sherwin-Williams Company, 601 Canal Road, N.W., Cleveland, has issued a booklet covering its line of "Ajax" insulating varnishes and compounds, acid-proof paints, wire enamels, etc. In addition to giving a description of these products it contains recommendations and detail specifications for the uses of the insulating varnishes and compounds.

WATERPROOFING AND DAMPPROOFING.—The Truscon Laboratories, Detroit, Mich., has issued Book "A," which is one of a series of six books. This book contains new and revised specifications on all their waterproofings, including waterproofing mass concrete, cement stucco, brick masonry, also various damp-proofing paints, oilproofings and quick-set for concrete. The book is of standard size for filing and is equipped with a filing tab.

CARBON BRUSHES.—The Corliss Carbon Company, Bradford, Pa., has issued a wall chart showing the forty different styles of carbon brushes made by the company and arranged in order to assist in ordering of correct carbon brushes.

GONDOLA CAR DUMPER.—Bulletin No. 804 issued by the Link-Belt Company, 910 South Michigan Avenue, Chicago, describes the operation and use of the Link-Belt gondola car dumper. Illustrations of typical installations and line drawings showing method of operation are included.

FIRE PUMP CONTROLLERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing leaflet L-1500, covering its dead-front fire-pump controllers for squirrel-cage and wound-rotor motors. It contains ratings for both types of motors, the arrangement of the operating handles, panels and meters, and a description of the cabinet.

INDUCTION MOTORS.—Bulletin No. 143 issued by the Robbins & Myers Company, Springfield, Ohio, describes its type "L" constant speed, polyphase induction motors. This motor is manufactured in ratings from 1 hp. to 75 hp. The company is also distributing a leaflet calling attention to its type "RA" repulsion-induction motors, made in ratings from ½ hp. to 7½ hp.

STREET LIGHTING.—The Holophane Glass Company, 342 Madison Avenue, New York City, has issued booklet No. 350, entitled "Streets That Are Safe," in which it describes its various types of lamps and fixtures for street lighting. It also contains a list of some of the cities in which "Holophane" refractors are used for street-lighting service.

TROLLEY WIRE.—"Phono-Electric" is the title of a booklet issued by the Bridgeport Brass Company, Bridgeport, Conn., containing technical data and tables, and illustrations showing the installation of "Phono-Electric" trolley wire on various railways throughout the United States. A description of its new wire, "Phono-Hi-Strength," is also included.

Foreign Trade Opportunities

PROPOSED ELECTRICAL POWER SCHEME FOR DURBAN, SOUTH AFRICA.—Tenders will soon be called for by the South African Electrical Supply Commission, according to Perry J. Stevenson, Trade Commissioner, Johannesburg, for the Durban power scheme. Foundation, building and plant equipment will be required. The plans call for an output of 24,000 kw. in two units of 12,000 kw. each. These tenders are to be issued by the National Bank of South Africa, 44 Beaver Street, New York City, simultaneously with similar calls for tenders that will be issued in London and Johannesburg.

ELECTRICAL EQUIPMENT AND METAL WORK FOR BRIDGE IN AUSTRALIA.—Tenders will be received by the New South Wales Department of Public Works, Sydney, Australia, until Sept. 14 for electrical equipment and metal work for a bascule bridge over Cook's River at General Holme's Drive. (Contract No. 1.)

TURBINES, GENERATORS AND SWITCHGEAR FOR MARLBOROUGH, NEW ZEALAND.—Tenders will be received by the Marlborough Electric Power Board, Marlborough, New Zealand, until Sept. 22 for turbines, generators and switchgear.

PROPOSED POWER PLANT IN PANAMA.—A contract has been entered into between the Republic of Panama and a local business firm, according to *Commerce Reports*, for the installation of an electric light and power plant in that city, work to begin within six months and to be completed within one year. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or its district offices, by referring to No. 175,036.

New Incorporations

THE PERRY POWER & ICE COMPANY, 1310 Standard Oil Building, Baltimore, Md., has been incorporated by Herman A. Lang and Joseph A. Slattery.

THE ARKANSAS PUBLIC SERVICE COMPANY, Blytheville, Ark., has been incorporated by Charles H. Rowland and L. A. Mitchell.

THE PORTNEUF POWER COMPANY, Montreal, Quebec, has been incorporated by Gordon W. McDougall and William B. Scott, Montreal. The company is capitalized at $1,000,000 and proposes to develop power in the municipalities of Quebec, Three Rivers and other towns. The company plans to rebuild the dam at Waltham, which was destroyed by floods last spring.

THE LONE STAR STATE POWER COMPANY, San Antonio, Tex., has been incorporated with a capital stock of $10,000 by Jordan Fowler, James A. Harley and John W. Gaines, all of San Antonio.

Construction News

Projects, Plans, Bids and Contracts,
Contemplated or Under Way

New England States

CRANSTON, R. I.—Electric power equipment will be installed in the proposed local textile mill to be erected by the Respro Mills, Inc., recently organized, to cost about $200,000. C. H. Makepeace & Son, Providence, are engineers.

NAUGATUCK, CONN.—The installation of an improved lighting system on Church Street is under consideration by the Borough Council.

NORWICH, CONN.—Extensions are contemplated to the Norwich State Tuberculosis Hospital, including additions to buildings, repairs to reservoirs and improvements to power plant, for which $226,700 has been appropriated.

TORRINGTON, CONN.—Bids are being asked by the Torrington Electric Light Company for the construction of a dam 700 ft. long and from 15 to 16 ft. high, on its property in Winsted.

WATERBURY, CONN.—Electric power equipment will be installed in the proposed addition to the plant of the Patent Button Company, Brown Street, to cost about $100,000. Westcott & Mapes, New Haven, are architects.

Middle Atlantic States

BROOKLYN, N. Y.—Plans have been prepared by the Brooklyn Edison Company for the construction of a substation, on Hicks Street, to cost about $50,000.

BUFFALO, N. Y.—Electric power equipment will be installed in the proposed mill to be built at 120 Prenatt Street, by the Ralston Purina Mills, 801 South Eighth Street, St. Louis, Mo., to cost about $300,000.

BUFFALO, N. Y.—The Public Service Commission has granted the Niagara, Lockport & Ontario Power Company permission to extend its transmission and distribution systems to serve the towns of Mansfield, Lyndon and Arkwright, and to exercise franchises granted by the Town Boards. The company plans to erect lines in the town of Mansfield to serve the hamlets of Eddyville and Naples and Cuba.

FARMINGDALE, N. Y.—Bids will be received by the board of managers, Nassau County Sanatorium, at the office of George L. Hubbell, president, Garden City, until July 27 for construction, plumbing, heating and electrical work and sewage disposal plant, separate bids, for additional buildings and alterations to the Nassau County Tuberculosis Hospital at Farmingdale.

GOUVENEUR N. Y.—Bids will be received by the Board of Lighting Commissioners of Gouveneur until Aug. 3 for construction of a hydro-electric development. The work will include a concrete dam 175 ft. long, and 7 ft. high and power house, and also dismantling of the old dam and building foundations. Lewis C. Reynolds, 387 Castle Street, Geneva, is engineer.

NEW YORK, N. Y.—Plans for the proposed laundry of the Stancot Laundry Company, 164 East Fifty-third Street, to cost about $400,000, include a power house.

NEW YORK, N. Y.—Bids will be received by New York Central Railroad Company, until Aug. 3 for furnishing voltage regulators for 2,200-volt signal feeders, to be covered by serial contract No. 20-1926. C. S. White, Room 344, 466 Lexington Avenue, New York City, is purchasing agent.

SALAMANCA, N. Y.—The Niagara, Lockport & Ontario Power Company, Buffalo, has been granted permission to extend its transmission lines to serve electricity in Salamanca and to exercise a franchise granted by the Town Board. Service will also be supplied to cottages along the new highway now being built from Salamanca to the Allegheny State Park.

SYRACUSE, N. Y.—The Public Service Commission has granted the Syracuse Lighting Company authority to erect a high-tension transmission line in portions of the towns of Phoenix, Volney and Schroeppel. No electric energy will be supplied in any of the towns, the transmission line is being built from Phoenix to Fulton, to deliver current to the Fulton Light & Power Company. The proposed line will be about 10 miles long, and will cost about $70,000.

WESTMORELAND, N. Y.—Permission has been granted the Adirondack Power & Light Corporation, Schenectady, to erect a distributing system in Westmoreland and to exercise a franchise granted by the Town Board. Electricity will be secured from its proposed high-tension line to be erected between Oneida and Utica.

BEACH HAVEN, N. J.—The Supreme Court has authorized the Borough Council to proceed with proposed additions and improvements in the municipal electric plant, and to issue $35,000 in notes to pay for same.

NEW BRUNSWICK, N. J.—Plans for the proposed local plant of the Lyons' Piece Dye Works, Fifth Avenue, Paterson, to cost about $10,000, include a power house.

PLAINFIELD, N. J.—The Borough Council has adopted a resolution authorizing the Street and Lighting Committee to negotiate with the Public Service Electric Company for an improved lighting system on Somerset Street. The erection of ornamental lamps between Green Brook Bridge and Linden Avenue on that thoroughfare is recommended.

PRINCETON, N. J.—The Borough Council has authorized plans for extensions and improvements in the street-lighting system.

WHARTON, N. J.—Plans have been prepared by the Onyx Hosiery, Inc., for a power house at its local mill, to cost about $35,000. Russell G. Cory, 30 Church Street, New York, is engineer.

ALLENTOWN, PA.—The City Council has authorized extensions in the ornamental lighting system on Eighth and Ninth Streets, for which bids will soon be asked.

BETHLEHEM, PA.—Plans for the proposed local locomotive and repair shops to be built by the Central Railroad of New Jersey, 143 Liberty Street, New York, at a cost of about $1,000,000, include a power house.

LEHIGHTON, PA.—The Lehighton Electric Light & Power Company is installing an ornamental lighting system in the business section and is erecting a transmission line to Parryville. L. B. Horne is general manager.

MEDIA, PA.—The City Council is considering a proposal submitted by the Delaware County Electric Company, Chester, which involves abandoning the municipal electric generating plant and purchasing electricity to operate the local system for a period of five years.

NEW CASTLE, PA.—Bids will be received by the City School District, until August 3, for electrical materials, supplies,

etc., for the manual training shops. H. M. Marquis is secretary.

PHILADELPHIA, PA.—Plans have been filed by Sears, Roebuck & Company, Roosevelt Boulevard, for a power house at their distributing plant, to cost about $35,000.

SHAMOKIN, PA. — Extensions of its transmission lines into the mining villages of Latimer No. 2 and Scotch Hill, with possible illumination of the streets is under consideration of the Pennsylvania Power & Light Company, Allentown.

BALTIMORE, MD.—The installation of an ornamental lighting system on Charles Street from Mount Royal Avenue to Read Street, is under consideration by the Electrical Commission. Charles F. Good is chief engineer.

BURNSVILLE, W. VA.—The West Virginia Light, Heat & Power Company is planning to rebuild its power plant, recently damaged by fire.

PURCELLVILLE, VA. — Surveys are being made by the Loudon Light & Power Company to extend its transmission lines to Middleburg via Philmont, Pot House and Foxcroft, where it has been granted a franchise.

RICHMOND, VA—Plans for the proposed local cigarette factory to be built by the American Tobacco Company, 111 Fifth Avenue, New York, to cost about $500,000, include a power plant.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until August 10, for 100 telephones, 66 breast transmitters, etc.

WASHINGTON, D. C.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, until August 5, for fan and motor, electric system, and miscellaneous work at the local naval hospital (Specification 5068).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until July 28, for voltmeters, ammeters and watthour meters (Schedule 4046); for three switchboards and spare parts (Schedule 4066), for electrical insulating varnish (Schedule 4070), and 100,000 weatherproof sockets (Schedule 4071).

North Central States

HUDSONVILLE, MICH.—Arrangements have been made whereby the Consumers Power Company, Jackson, will extend its transmission lines to Hudsonville and install an electric lighting system here.

ROCKWOOD, MICH.—Plans for the proposed local glass manufacturing plant to be built by a new company organized by Gustav J. H. Peters and Charles J. Pillow, to cost about $5,000,000, include a power house and machine shop. Tuyl, Heart & Barron, Detroit, are engineers.

MARIETTA, OHIO.—The installation of an ornamental lighting system on Greene Street is under consideration by the City Council.

SPRINGFIELD, OHIO.—Surveys are being made by the Ohio Edison Company for the construction of a steam-operated electric plant on the Mad River, near here.

STEUBENVILLE, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 11 for furnishing and installing fixtures in the United States post office, Steubenville. For details see Searchlight Section.

LEXINGTON, KY.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 5, for the remodeling of a parcel post lift in the United States post office, Lexington. For details see Searchlight Section.

CHICAGO, ILL. — A permit has been granted the Commonwealth Edison Company to construct a power substation at 6917 Kenwood Avenue, to cost about $75,000.

GALESBURG, ILL. — Application has been made by the Illinois Power & Light Corporation to the Commerce Commission for permission to erect a steel-tower, double-circuit, 66,000-volt transmission line from Hamilton to Galesburg and a tap into Monmouth. The company has also petitioned for permission to build a line from Galesburg to Galva.

ODIN, ILL.—The Illinois Power & Light Corporation, Chicago, has applied to the Commerce Commission for permission to purchase the local electric distribution system of the Odin Coal Company, and also for permission to erect a transmission line from its present line in Sandoval to the village of Odin and also to supply service to residents along the line.

STAUNTON, ILL.—The City Council has engaged the W. A. Fuller Company, Railway Exchange Building, St. Louis, to prepare plans for improvements to waterworks system, to cost about $200,000. The work will include motor-driven pumping equipment, dam and impounding reservoir, etc.

STEWARD, ILL.—Plans are being prepared by the Illinois Northern Utilities Company, Dixon, for the erection of a transmission line from Shabbona to Steward, about 15 miles, for service in this district. The line will also be extended to Lee, where the municipal electric plant has been acquired.

ALGOMA, WIS.—Plans are being considered by the Municipal Water and Light Department for rebuilding the municipal electric distributing system, in order to meet the increasing demands for electrical service.

GREEN BAY, WIS.—Plans have been completed by the Wisconsin Public Service Corporation for extending its transmission lines to Rankin and Rio Creek this summer.

MADISON, WIS.—The City Council is considering the installation of ornamental lamps on Atwood Avenue and Winnebago Street.

MADISON, WIS. — Surveys are being made by the Wisconsin Power & Light Company with a view of building a hydro-electric plant on the Wisconsin River, at Ferry Bluff, about 6 miles below the Prairie du Sac plant of the Wisconsin River Power Company.

MARINETTE, WIS. — Plans are under way by the Menominee & Marinette Light & Traction Company for the construction of a substation in Marinette to connect the local lines with the main transmission system of the Wisconsin Public Service Corporation.

MILWAUKEE, WIS.—Plans have been announced by the Milwaukee Electric Railway & Light Company for the installation of an additional 30,000-kw. generating unit in its Lakeside power plant, to cost about $1,000,000, exclusive of boiler equipment, which has already been provided for. John Anderson, chief engineer of the company, will have charge of the work.

OAKFIELD, WIS.—The Village Board has accepted the plan of the Wisconsin Power & Light Company, Madison, for installing a new street-lighting system in the business section. Plans have been prepared by the company for rebuilding its local distribution system.

STOUGHTON, WIS.—The City Council has decided to install new generating equipment in the municipal electric plant to cost about $30,000, instead of repairing the old machinery.

ST. PAUL, MINN. — Plans have been filed by the Waldorf Paper Products Company, Myrtle and Pillsbury Avenues, for a power plant at Hampden and University Avenues, to cost about $100,000. H. A. Sullwold, 107 East Third Street, is architect.

GREAT BEND, KAN. — Arrangements are being made by the Great Bend Water & Electric Company to rebuild its transmission line between here and Hoisington, at a cost of about $40,000.

GREENSBURG, KAN. — Bonds to the amount of $50,000 have been voted for extensions and improvements to the municipal electric plant.

Southern States

ELIZABETHTOWN, N. C. — The Tide Water Power Company, Wilmington, contemplates extensions in transmission lines in this section.

WEST END, N. C.—Plans have been prepared by the Carolina Power & Light Company, Raleigh, for the construction of a local substation, to cost about $20,000.

CHARLESTON, S. C. — The Charleston Consolidated Railway & Lighting Company has applied for permission to lay a submarine cable line in the Ashley River.

ATLANTA, GA.—Plans are being prepared by the Atlantic Ice & Fuel Company, Washington Street Viaduct, for the construction of an ice plant of 1,000 tons daily capacity, and storage capacity of 15,000 tons, to cost about $300,000. A. Doyle is chief engineer.

VIDALIA, GA.—The City Council contemplates the installation of an ornamental lighting system in the business district, to cost about $25,000.

ARCADIA, FLA.—The Commissioners of De Soto County have granted the Southern Utilities Company, Palatka, a thirty-year franchise.

BARTOW, FLA.—Bids will be received by the City Council, G. J. McNamee, clerk, until August 12, for equipment for the municipal waterworks, including one 1,000-kw. turbo-driven generator; two watertube boilers, with superheaters, surface condenser and auxiliary apparatus. Also, for two 400-kw. direct-connected generators and exciters, two 600-hp. Diesel engines, switchboard additions, etc. E. V. Camp and Associates, Bartow, are consulting engineers.

HOMESTEAD, FLA.—The installation of an ornamental lighting system in Homestead is under consideration.

JACKSONVILLE, FLA. — Negotiations are under way between the Commissioners of Duval County and Frank H. Owen, city commissioner of public utilities, relative to the installation of an ornamental lighting system on the Atlantic Boulevard. It is also proposed to furnish electric service to residents along the line.

PACE, FLA.—The Pace Lumber Company plans to install electric power equipment in connection with the rebuilding of its mill, recently destroyed by fire with loss of about $150,000.

ST. PETERSBURG, FLA. — Plans are being considered for the installation of an ornamental lighting system on the proposed "bay to bay boulevard." The proposed thoroughfare will be 100 ft. wide, and 11 miles long, and will extend from Tampa Bay to Boga Ceiga Bay. R. J. Blanc is president of the organization in charge of the project.

SEBASTIAN, FLA.—An election will be held on Aug. 3 to vote on the proposal to issue $50,000 in bonds for an electric light and ice plant.

TAMPA, FLA. — The Tampa Electric Company has been granted a franchise to operate in all parts of Hillsborough County.

TAMPA, FLA.—Plans are under consideration by the Tampa Electric Company for the erection of a transmission line connecting the Tampa plant with the plant of the Pinellas County Company at St. Petersburg and also the plant of the Florida Power Company at Dunnellon.

ZEPHYRILLS, FLA. — The Council is considering an election to vote on the proposal to issue bonds for the installation of an ornamental lighting system.

MEMPHIS, TENN.—The installation of a new lighting system on Jefferson Avenue from Front Street to Third Street is under consideration by theh City Council.

TRENTON, TENN. — Plans are being prepared by the Water and Light Department for an ornamental lighting system for the business district, to be installed early in 1926. A. E. Cunningham is city engineer.

TREZEVANT, TENN.—The City Council is considering a bond issue of $35,000, the proceeds to be used for the construction of a municipal lighting plant and waterworks.

MOULTON, ALA.—The City Council has granted the Alabama Power Company a franchise to operate in the city.

HAZLEHURST, MISS. — Improvements are contemplated to the municipal electric plant. It is proposed to install oil engines direct-connected to generators.

BATESVILLE, ARK.—Plans are under way for the installation of an ornamental lighting system, consisting of seventy-four lamp standards, for which $12,500 has been voted.

LAKE CHARLES, LA.—Plans are under consideration for the installation of an ornamental lighting system from the City Hall in Ryan Street to the Southern Pacific tracks.

NEW ORLEANS, LA.—Bids will be received by the supervising architect, Treasury Department, Washington, D. C., until August 12, for lighting fixtures, etc., at the local quarantine station.

PORT ALLEN, LA.—The Baton Rouge (La.) Electric Company has been granted a franchise to supply electricity here.

WAURIKA, OKLA.—The Southwestern Light & Power Company, Oklahoma City, has purchased the property of the Consumers Light & Power Company subject to confirmation by the granting of a franchise to the Southwestern company at an election to be held at a later date. If taken over Waurika will be served by a 10-mile transmission to be erected from Hastings.

BEAUMONT, TEX.—Bids, it is understood, will soon be asked by the East Texas Electric Company for the construction of a power plant of 120,000 kw. capacity, to cost about $5,000,000. Stone & Webster, Inc., 147 Milk Street, Boston, is engineer.

CROSBYTON, TEX.—The power plant of the Cap Rock Light & Power Company has been acquired by the Texas Utilities Company, Plainview, which plans extensions in its transmission system in this section.

TEMPLE, TEX.—The Temple Ice & Refrigerating Company is planning to build a 40-ton ice plant, to cost about $150,000. Ophuls & Hill, 112 West Forty-second Street, New York City, are engineers.

WACO, TEX.—Plans are under way by the Texas Power & Light Company, Dallas, to erect a transmission line from Waco to Hunter, a distance of about 150 miles, to cost about $600,000.

Pacific and Mountain States

SHELTON, WASH.—Application has filed by the West Coast Power Company, Portland, Ore., owner of the local plant, for a franchise to erect a transmission line to Charleston, for the purpose of furnishing electricity to towns in Kitsap County.

KLAMATH FALLS, ORE.—Permission has been granted the California-Oregon Power Company, San Francisco, to construct a hydro-electric project on the Linke River, a tributary of the Klamath River, to cost about $500,000, with transmission line.

LA GRANDE, ORE.—Extensions are contemplated by the Eastern Oregon Light & Power Company, Baker, in its transmission line between Union and La Grande and for improvements in substations and street lighting systems in both places, to cost about $80,000.

REDLANDS, CAL.—The City Trustees have authorized the installation of an ornamental lighting system on Olive Avenue, from Citrus Avenue to Bond Street, for which bids will soon be asked.

SAN FRANCISCO, CAL.—Arrangements are being made by the County Supervisors for the sale of $1,000,000 in bonds, the proceeds to be used for the Hetch Hetchy water project, including substations, electric locomotives, electric power equipment, etc.; erection of transmission line from Pedro siding to Oakdale Portal, 11 miles; telephone line from Moccasin Creek to Oakdale Portal, 18 miles.

SAN FRANCISCO, CAL.—Permission has been granted the Feather River Power Company to use water from Grizzly Creek and other tributaries of the North Fork of the Feather River, for two proposed hydro-electric developments, one to develop 29,600 hp., to cost about $7,700,000, and the other 11,285 hp., to cost about $5,000,000, with transmission lines, etc.

SANTA BARBARA, CAL.—The Southern California Edison Company, Los Angeles, plans to build a power plant at Quarantina and Gutierrez Streets, to cost $250,000.

SHAVER, CAL.—Plans are being prepared by the Southern California Edison Company, Los Angeles, for the construction of a dam, 175 ft. high, in connection with a 6-mile tunnel project between Huntington Lake and Shaver, for hydro-electric development.

PHOENIX, ARIZ.—Plans for the proposed extensions and improvements in the irrigation system of the Roosevelt Water Conservation District, for which an issue of $1,000,000 in bonds has been approved, include the installation of pumping machinery and auxiliary equipment.

YUMA, ARIZ.—Bids will be received at the office of the Bureau of Reclamation, Yuma, until Aug. 20 for the construction of building and foundations and for installation of machinery for siphon drop power plant, Yuma project. No materials or electrical equipment are to be purchased under this advertisement.

Canada

ST. JOHN, N. B.—Bids will be received by the New Brunswick Hydro-Electric Power Commission, St. John, until July 30 for construction work in connection with the proposed hydro-electric development at Grand Falls. S. R. Weston is chief engineer of the commission.

OTTAWA, ONT.—The Provincial Government of Ontario has authorized the Hydro-Electric Power Commission of Ontario to proceed with the development of five additional water power sites on the Ottawa River, which it is estimated will develop about 250,000 hp., at an ultimate cost of about $25,000,000. Work, it is reported, will begin soon on a project to supply 20,000 hp. additional to the city of Ottawa.

Electrical Patents

Announced by U. S. Patent Office

(Issued June 23, 1925)

1,542,883. METER; F. Holden, Hampstead, London, England. App. filed Feb. 27, 1922. Of the mercury-motor type.

1,542,898. RAIL BOND; M. H. Loughridge, Bogota, N. J. App. filed Oct. 25, 1920.

1,542,931. AUTOMATIC ELECTRIC SWITCH; E. B. Foote, Rochester, N. Y. App. filed April 21, 1923. Adapted to be operated by fluid pressure, from a distant station if desired, for opening or closing a switch controlling an electric circuit.

1,542,938. AUTOMATIC ANTENNA SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed July 9, 1920.

1,542,950. FUSE; E. L. Ogle, Chicago, Ill. App. filed Sept. 2, 1921. Cartridge type.

1,542,958. AUTOMATIC TELEPHONE SYSTEM; A. J. Ray, Chicago, Ill. App. filed Jan. 21, 1921.

1,542,967. ELECTRIC HEATER; M. H. Schoenberg, San Francisco, Cal. App. filed Nov. 19, 1923. Radiant type.

1,542,977. TELEPHONE-EXCHANGE SYSTEM; S. B. Williams, Brooklyn, N. Y., and E. E. Hinrichsen, New York, N. Y. App. filed April 30, 1923. Automatic.

1,542,984. WELDING MACHINE; G. J. Blum, Chicago, Ill. App. filed Dec. 30, 1921. For welding two metallic parts together edge to edge.

1,542,994. METHOD AND APPARATUS FOR TESTING TELEPHONE RECEIVERS; V. Durbin, Newton, Mass. App. filed Jan. 10, 1923.

1,543,001. MAGNETIC CORE; E. G. Gaynor, Stratford, Conn. App. filed Sept. 5, 1923. For electromagnets or other apparatus.

1,543,012. INSTANTANEOUS HEATER; A. K. Klimis, Baltimore, Md. App. filed Dec. 11, 1922.

1,543,117. ACCOUSTICAL AID FOR DEAF PERSONS; J. P. Maxfield, Millburn, N. J. App. filed Sept. 28, 1921.

1,543,119. DISTRIBUTING APPARATUS; H. Pfannenstiehl, Maplewood, N. J. App. filed Nov. 1, 1920. For use in printing-telegraph systems of the multiplex synchronous type.

1,543,124. FREQUENCY STANDARD; N. H. Ricker, Houston, Tex. App. filed July 9, 1924.

1,543,125. CONTROL OF RELAYS; H. R. Robinson, Brooklyn, N. Y. App. filed April 21, 1924. Electric discharge relay apparatus.

1,543,184. HEAT CONTROL; L. R. Oakes, Tipton, Ind. App. filed Nov. 3, 1920. As used with an electrically heated incubator.

1,543,213. CABLE CONNECTOR; A. T. Kvarnstrom, Detroit, Mich. App. filed May 12, 1923. For securing an electric cable to an outlet box.

1,543,225. ELECTROLYTIC APPARATUS HAVING FILMED ELECTRODES; R. D. Mershon, New York, N. Y. App. filed Oct. 29, 1919. As in condensers, rectifiers and lightning arresters.

1,543,290. CIGAR LIGHTER; B. L. Metzger and T. D. Sheely, Toledo, Ohio. App. filed March 26, 1924.

1,543,313. INSULATOR; A. O. Austin, Barberton, Ohio. App. filed Dec. 6, 1920. Construction of joints connecting parts of such insulators.

1,543,352. INCLOSED-SWITCH CONSTRUCTION; F. T. Wheeler, Plainville, Conn. App. filed July 3, 1922. Safety switch.

1,543,362. ELECTRIC COOKING DEVICE; R. Boletino, Vancouver, B. C., Canada. App. filed Jan. 17, 1924. Grill.

1,543,370. ELECTRIC DISTRIBUTION SYSTEM; P. H. Chase, Bala, Pa. App. filed July 1, 1924. Means for isolating sections, etc.

1,543,408. THERMALLY OPERATED CIRCUIT CONTROLLER; G. H. Whittingham, Baltimore, Md. App. filed Aug. 29, 1922. For use in connection with electric motors as a load-limit device.

1,543,417. SYSTEM OF RADIO COMMUNICATION; H. A. Bremer, Chicago, Ill. App. filed Dec. 1, 1924.

1,543,475. RESONANT CONVERTER; W. S. Lemmon, New York, N. Y. App. filed Jan. 14, 1920.

1,543,495. OIL CIRCUIT BREAKER; A. J. Bowie, San Francisco, Cal. App. filed Dec. 5, 1921. Quick horizontal break.

1,543,502. DYNAMO-ELECTRIC MACHINE; H. M. Hobart, Niskayuna, N. Y. App. filed March 25, 1924. With means for inclosing the stator windings in an insulating and cooling medium, such as oil.

1,543,514. ELECTRIC STEAM BOILER; A. N. Otis, Schenectady, N. Y. App. filed May 16, 1924.

1,543,524. BATTERY CLIP; H. B. Sherman, Battle Creek, Mich. App. filed April 24, 1924.

1,543,529. ELECTROMAGNETIC MEASURING INSTRUMENT; G. W. Sprenger, Lynn, Mass. App. filed April 11, 1924.

1,543,534. PROCESS OF WET MAGNETIC SEPARATION ON ROLLER SEPARATORS; G. Ullrich, Magdeburg, Germany. App. filed Oct. 18, 1923.

1,543,537. DYNAMO-ELECTRIC MACHINE; J. Wilkinson, Lynn, Mass. App. filed May 2, 1922. Ventilation of the rotatable members.

1,543,545. DENTAL APPARATUS; E. M. Boatner, San Antonio, Tex. App. filed April 10, 1924. Heating device.

1,543,546. FORCED-OIL TRANSFORMER; L. H. Burnham, Pittsfield, Mass. App. filed Feb. 27, 1922.

1,543,557. THERMOSTATIC CIRCUIT CLOSER; A. M. Greaves, Cambridge, Mass. App. filed Jan. 17, 1922.

1,543,576. OUTLET BOX; H. G. Knoderer, Englewood, N. J. App. filed May 2, 1923.

1,543,609. SEMI-AUTOMATIC TELEGRAPH TRANSMITTER; L. C. McIntosh, Los Angeles, Cal. App. filed May 31, 1921.

1,543,654. X-RAY APPARATUS; W. D. Coolidge, Schenectady, N. Y. App. filed Jan. 18, 1922.

(Issued June 30, 1925)

1,543,662. CALLING DEVICE; W. T. Booth, Brooklyn, N. Y. App. filed May 2, 1921. For automatic-telephone system.

1,543,665. ALARM SYSTEM FOR AUTOMATIC TELEPHONE EXCHANGES; R. D. Conway, East Orange, N. J. App. filed Dec. 29, 1922.

1,543,666. AUTOMATIC TELEPHONE SWITCH; H. F. Dobbin, New York, N. Y. App. filed April 30, 1923.

1,543,667. AUTOMATIC TELEPHONE SWITCH; O. F. Forsberg, Yonkers, N. Y. App. filed May 1, 1923.

1,543,668. ARRANGEMENT FOR ELIMINATING NOISES IN HIGH FREQUENCY; H. Gewecke, Berlin, Germany. App. filed April 30, 1923.

1,543,669. AUTOMATIC TELEPHONE SWITCH; C. L. Goodrum, New York, N. Y., and O. F. Forsberg, Yonkers, N. Y. App. filed April 30, 1923.

1,543,670. CO-ORDINATE SWITCH; F. H. Graham, New York, N. Y. App. filed Sept. 7, 1922. In an automatic telephone-exchange system.

1,543,671. TELEPHONE SYSTEM; E. E. Hinrichsen, New York, N. Y. App. filed April 23, 1920. Ringing circuit.

1,543,685. SEMI-AUTOMATIC TELEPHONE SYSTEM; R. L. Stokely, Floral Park, N. Y. App. filed July 1, 1921.

1,543,688. SWITCHING SYSTEM; R. S. Wilbur, Lyndhurst, N. J., and E. D. Johnson, East Orange, N. J. App. filed Dec. 17, 1920. For composite telephone and telegraph operation.

1,543,692. OVEN; H. M. Biebel, Oakmont, Pa. App. filed Feb. 8, 1923. For heat treating materials.

1,543,695. BRASS MELTING FURNACE; O. A. Colby, Irwin, Pa. App. filed Jan. 12, 1923.

1,543,696. REGULATOR SYSTEM; F. Conrad, Pittsburgh, Pa. App. filed Sept. 16, 1918. For governing the excitation of generators in accordance with supply-circuit conditions.

1,543,697. SYSTEM OF DISTRIBUTION; A. W. Copley and R. D. Evans, Wilkinsburg, Pa. App. filed Nov. 7, 1917. Particularly measuring and controlling devices for such systems.

1,543,699. DISCONNECTING SWITCH; L. N. Crichton, Edgewood Park, Pa. App. filed Nov. 2, 1920.

1,543,708. ELECTRIC CIGAR LIGHTER; L. J. Greenawalt, Mansfield, Ohio. App. filed May 9, 1923.

1,543,709. SWITCH MECHANISM; A. J. Hall, Winchcombe, England. App. filed Jan. 31, 1921. For controlling a plurality of motor circuits.

1,543,710. HEATER CONTROL SYSTEM; H. A. Hands, Swissvale, Pa. App. filed April 18, 1922. For maintaining the temperature of an electric furnace within a predetermined range.

1,543,712. BALL BEARING TROLLEY WHEEL; W. Jetter, Collingswood, N. J. App. filed Jan. 21, 1922.

1,543,721. RADIANT HEATING UNIT; J. H. Proctor, Wilkinsburg, Pa. App. filed June 30, 1923.

1,543,722. CIRCUIT CONTROLLER; F. L. ReQua, Milwaukee, Wis. App. filed May 27, 1921. For single-phase motors.

1,543,726. RADIO TRANSMISSION RECORDING SYSTEM; K. Rottgardt, Dahlem, near Berlin, Germany. App. filed Aug. 26, 1921.

Financial and Corporate

Utility Stocks Advance

Merger Rumors and Improved Earnings Strengthen Position of Various Groups

A RETURN of distinctly easier money last week raised prices on the New York Stock Exchange, generally speaking, to the highest levels on record and also had its favorable market effect on the position of both the listed and unlisted power and light shares. Merger possibilities and the good reports of earnings during the first part of 1925 stimulated buying of the utility stocks at peak levels. While Wall Street generally agrees that many issues are selling at levels higher than are justified on the basis of current earnings, in many quarters it is pointed out that the bright prospect for great growth in the future is what gives these stocks special attraction.

In the week under review virtually all of the active power and light stocks improved their position. North American common was actively accumulated and ran up sharply to a new high record for the stock at 59. American Water Works & Electric climbed again to a level above 57. Among the unlisted issues the most spectacular gains were those made by Southern California Edison, which rose over 14 points; American Public Utilities, which rose 20 points; Georgia Light, Power & Railways, which rose 14 points, and the General Gas & Electric issues, which improved by roughly 13 points each. The new General Gas & Electric issues also showed strength.

Among the lower-priced issues Northern Ohio Power was a favorite, being accumulated at rising prices in large blocks. The prevailing price was in the neighborhood of 13 as the week closed. Other gainers were Adirondack Power & Light, Electric Investors, Lehigh Power Securities, Mohawk-Hudson, National Power & Light, Power Corporation of New York, Tampa Electric and United Gas & Electric.

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of June:

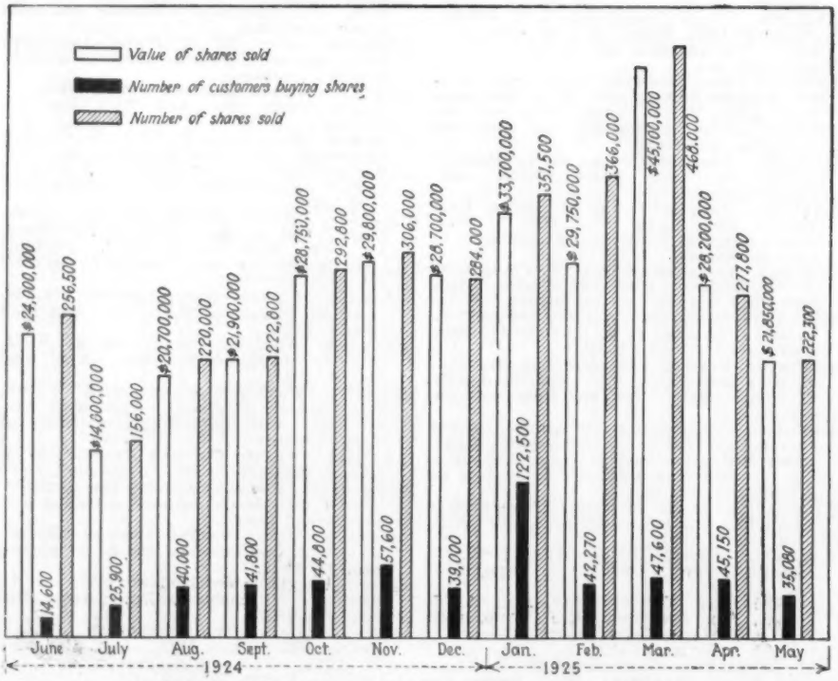
Name of Company	Gross Earnings for June 1925	1924
Adirondack Power & Light	629,327	543,851
Cities Service	$1,858,429	$1,649,962
Detroit Edison*	2,807,769	2,358,620
Havana Elec. Ry., Lt. & Pr.	†1,267,903	†1,184,085

*Includes other revenue. † May.

May Customer Sales Total $21,850,000

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to customers and employees, it is estimated that during May a total of 222,300 shares were sold in this manner.

The total value of the stock sold is estimated at $21,850,000 and a total of 35,080 customers participated in the sales. The average sale to each customer was $623.



SEASONAL DECREASE IN SALES OF STOCK TO CUSTOMERS

New Capital Issues

During the past week the Iowa Southern Utilities Company floated an issue of first and refunding mortgage 5½ per cent gold bonds to the amount of $3,000,000, the price being 97½ and interest to yield about 5.70 per cent. These bonds were dated July 1, 1925, and mature July 1, 1950. The proceeds of the issue will be used to reimburse the company for additions to the properties, for improvements and for other corporate purposes.

The Southwestern Gas & Electric Company made an offering of its 7 per cent cumulative preferred stock (par value $100) at $96 per share and accrued dividends to yield 7.29 per cent. This financing involved a total of $1,834,000.

In order to raise funds for the retirement of the entire outstanding series A participating preferred stock and of all the outstanding series A 8 per cent bonds the Metropolitan Edison Company offered during the week for public subscription 135,000 shares of series C preferred stock. The National Electric Power Company was also represented with a $3,000,000 issue of twenty-year 6 per cent secured gold bonds priced at 97 and accrued interest, to yield over 6.25 per cent.

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Cities Service, com.*	½	Sept. 1
Cities Service, com.†	½	Sept. 1
Cities Service, pf. & pf. B*	½	Sept. 1
Dallas Power & Light, pf.	1¾	Aug. 1
Middle West Utilities, com.	$1.25	Aug. 15
New England Company, com.	1½	Aug. 15
Pacific Power & Light, pf.	1¾	Aug. 1
Penn-Ohio Pwr. & Lt. 7% pf.	2	Nov. 2
Public Service Co. of No. Ill., 7% pf.	1¾	Aug. 1
Public Service Co. of No. Ill., 6% pf.	1½	Aug. 1
Standard Pwr. & Lt. (Del.), pf.	$1.75	Aug. 1
Standard Pwr. & Lt. (Md.), pf.	1.75	Aug. 1
West Penn Co., pf.	1¾	Aug. 15
Fairbanks, Morse & Co., com.	.65	Sept. 30
Fairbanks, Morse & Co., pf.	1¾	Sept. 1

* Monthly. † Payable in common stock.

Utilities to Call Securities Amounting to $12,317,455.—The Metropolitan Edison Company, chief subsidiary of the General Gas & Electric Corporation, and the Pennsylvania Edison Company, which is controlled by the Metropolitan, are planning to call for redemption stocks and bonds totaling $12,317,455. The entire issues of the series A preferred stock and the 8 per cent bonds, due 1935, of the Metropolitan Edison and all the outstanding preferred stock of the Pennsylvania Edison Company will be called. Holders of each of the issues to be retired will have the privilege of exchanging their present shares for the new shares, together with substantial cash payments.

Alabama Power Looks Into the Future

Annual Report for 1924, Just Published, Reveals Romantic Growth of the Utility and Its Plans for Development Through Cherokee Project

By Paul Willard Garrett

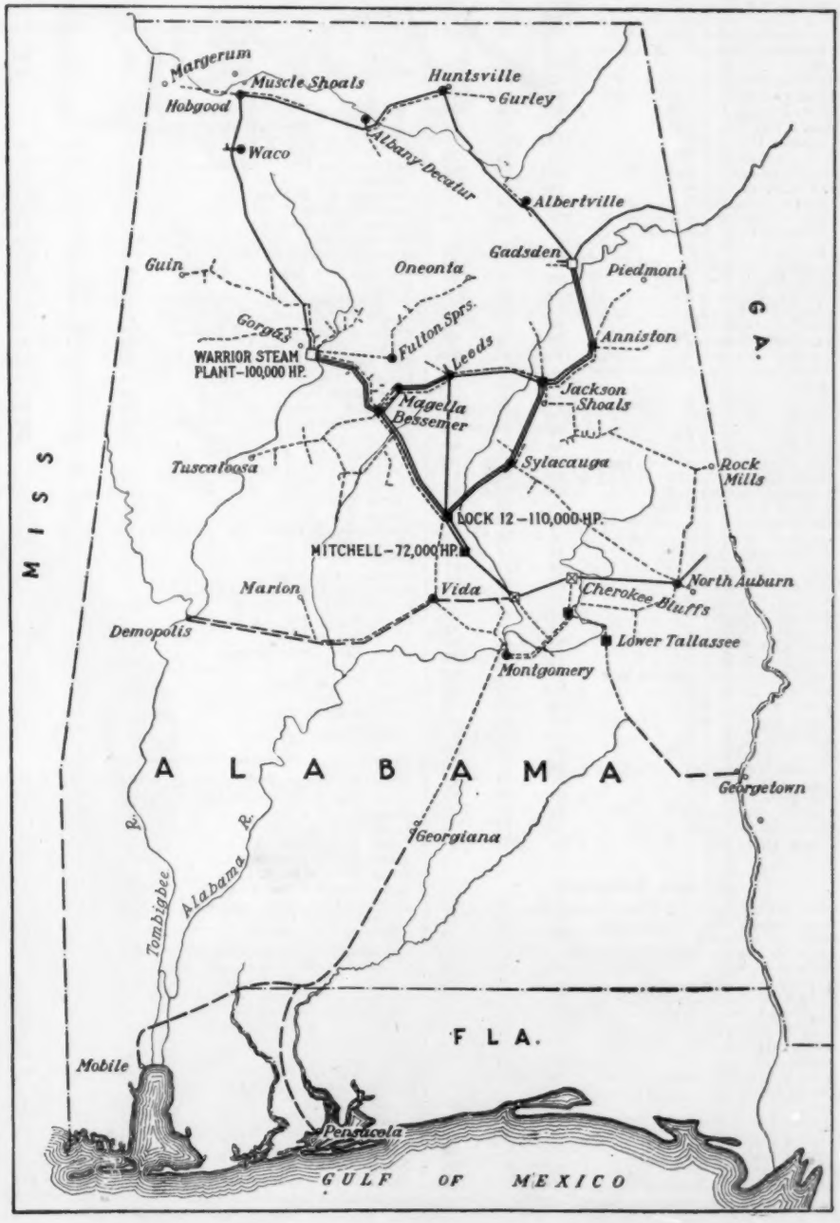
ILLUSTRATING its solid growth during the past ten years the Alabama Power Company, in its annual report for 1924, now published, reproduces on the same page maps both of the lines existing in 1915 and of the system today. Some modifications in capital structure have been made since 1915, of course, through creation of the parent holding utility, known as the Southeastern Power & Light Company, but a comparison of the system at the two stages gives a true picture of the growth. In the earlier stage a small triangle in north-central Alabama, and touching only a few points in the vicinity of Birmingham, covered the whole system. Today it spreads over the whole state. From the Muscle Shoals region, in the northeastern corner of the state, its constructed or projected lines reach to Mobile and Pensacola, on the Gulf of Mexico, and even to Gulfport, in southern Mississippi, within a hundred miles of New Orleans. Extension of service last year alone was made to more than thirty additional communities.

Gross operating revenues of the Alabama Power Company reached a new high total in 1924 at $8,823,389, which is nearly a million dollars, or 12 per cent, larger than the total of $7,863,294 shown for 1923. While operating expenses rose during the year, they did not rise in the same proportion as gross revenues. Operating expenses rose only from $4,278,222 in 1923 to $4,490,026 in 1924. Consequently, with so smart an improvement in gross revenues, net operating earnings reached a new high of $4,333,363, or 20 per cent greater than the figure for the year before. Electric operations accounted for 87 per cent of the gross revenues, gas operations contributing 5 and street railway 8 per cent of the total.

That these increased earnings were realized is not hard to understand by any one who has been following the operating data for recent years. Between 1914 and 1924, for example, the Alabama Power Company has steadily, year by year, raised its operating efficiency and increased its volume of business. The connected horsepower load in that time has risen year by year from 47,000 in the earlier year to 526,562 in 1924. Also, by steady yearly improvement, the maximum available capacity kva. has grown from 57,000 to 354,965. Not many power and light companies can, furthermore, show a more diversified load, an important factor in making for a steady, continuous growth in good times and bad.

Of the achievements recorded for 1924, President Thomas W. Martin is particularly proud of the progress made in obtaining a larger public participation in the company's business. While the Alabama Power Company now is able to borrow in the financial centers at the most favorable rates, a claim it could not make a few years ago, its relations in the state have been so improved that it experiences no difficulty in raising funds at home. Additions and improvements to the properties in 1924 took $8,837,333. The net proceeds from the sale of preferred stock reached $5,769,707, being more than the sum of such sales in the three years 1921 to 1923. Since 1920 the sales of preferred stock have so increased that it is now the most widely owned security in the state, excepting only Liberty bonds. More than 10,000 of the residents of the state now own Alabama Power securities and the company is among the leaders of the larger utilities in marketing its securities at home.

In the new report are given more details about the Cherokee Bluffs development than has been generally known to date. The new reservoir, which will be the largest artificial lake in the world, will, according to the report, "cover an area of approximately 40,000 acres of land, the length of shore line measured from one end of the dam to the other end by following the edge of the reservoir completely around being about 700 miles." The total available installed generating capacity at the present time is about 435,000 hp., not counting something like a possible 25,000 or 30,000 that has been added to the system through acquisition of Pensacola and Mobile plants or the enormous volume available from Muscle Shoals during the government's test period. The Alabama Power Company has larger undeveloped power reserves than any other utility in the South, and, seeing a great development for the future in the South, Mr. Martin's organization is now looking into the future to the time when more and more of this power will be needed.



ELECTRIC DISTRIBUTION SYSTEM OF ALABAMA POWER COMPANY

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, July 18	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—7%..	100	98	106
Adirondack Pwr. & Lt.—8%..	108	103	115
Appalacnian Pwr.—7%.....	98	92	100
Appalachian Pwr. 1st pf.—7%	100	95	101
Arizona Pwr.—7%.....	83	75	87
Arkansas Lt. & Pwr.—7%.....	96½	92	102
Asheville Pwr. & Lt.—7%....	*f* 101½	101	102½
Central Ill. Pub. Serv.—6%...	85	84	93
Cleveland Elec. Illg.—6%....	102	101	105
Colo. Pwr.—7%.....	94	93	98
Conn. Lt. & Pwr.—8%.....	115	115	118
Conn. Lt. & Pwr. —7%.....	106	105	110
*e*Con. Gas, El. Lt. & Pwr.—6½%	110	105	110½
Cons. Gas, El. Lt. & Pwr.—8%	124	123	126
Cons. Gas, El. Lt. & Pwr.—7%	109	108	112
Consumers' Pwr.—6%.....	94¾	90	97
Dayton Pwr. & Lt.—6%.....	95	88	100
Dubuque Elec.—6%.....	88½	80	90
Duquesne Lt.—7%.....	*f* 110½	105	111¾
East. Tex. Elec.—6%.....	100	100	105
Empire Dist. Elec.—6%.....	78	78	85
Ft. Worth Pwr. & Lt.—7%....	*f* 101½	101½	103
Georgia Ry. & Pwr.—4%.....	95	62	99
Gt. West. Pwr.—7%.....	100½	....	....
Ia. Ry. & Lt.—7%.....	97	92	100
Ill. North. Utilities—6%.....	88	82	92
Ill. Pwr. & Lt.—7%.....	95½	92½	98
Interstate Pub. Serv.—7%....	95	90	100
Kans. Gas & Elec.—7%.....	*f* 101	101	102½
Long Island Lighting—7%.....	102	100	105
Los Angeles Gas & Elec.—6%..	95	90	95
Milwaukee Elec. Ry. & Lt.—8%.....	100	98	105
Milwaukee Elec. Ry. & Lt.—7%	97½	96	105
Milwaukee Elec. Ry. & Lt.—6%	86	83½	87
Minn. Pwr. & Lt.—7%.....	*f* 100	100	101
Miss. River Pwr.—6%.....	92	87½	94
Nebraska Pwr.—7%.....	*f* 102½	102	103½
N. J. Pwr. & Lt.—7%.....	100	92	98
New Orleans Pub. Serv.—7%..	100½	94	102
N. Y. Central Elec.—7%.....	98½	96	100
Niagara Falls Pwr.—7%—25..	28	28	29
Niagara, Lock. & Ont. Pwr.—7%	107	101½	110
No. Caro. Pub. Serv.—$7—no par.....	91	90	96
No. Ohio Trac. & Lt.—6%....	73	64	75
North. States Pwr.—7%.....	96	95	100
Ohio Gas & Elec.—7%.....	90	87	100
Ohio Pwr.—6%.....	92	85	95
Ohio Pub. Serv.—7%.....	98	97	100
Pac. Gas & Elec.—6%.....	98	92	99
Pac. Pwr. & Lt.—7%.....	*f* 101½	101	102½
*c*Penn Central Lt. & Pwr.—no par.....	69¼	60	69¼
Penn-Ohio Pwr. & Lt.—7%....	94	91	100
Penn-Ohio Pwr. & Lt.—8%....	106	101	110
Penn. Pub. Serv.—7%.....	90	90	100
Penn Pub. Serv.—6%.....	80	80	90
Penn. Pwr. & Lt.—$7—no par.	*f* 103½	103½	104½
*c*Phila. Elec.—8%—25.....	38½	37½	45
Portland Elec. Pwr.—7%.....	97	95	99
Portland Elec. Pwr.—6%.....	75	70	80
Pwr. Corp. of N. Y.—7%.....	98	96	102
Pub. Serv. of No. Ill.—6%....	108	90	97
Pub. Serv. of Okla.—7%.....	94	87	95
Puget Sound Pwr. & Lt.—7%..	102	102½	109
Rochester Gas & Elec.—5%...	105	80	98
So. Calif. Edison—8%.....	125	115	128
So. Calif. Edison—7%.....	107½	105	107½
So. Calif. Edison—6%.....	95	90	95½
Tenn. Elec. Pwr.—6%.....	85	80	85
Tenn. Elec. Pwr.—7%.....	98½	93	103
Tenn. Elec. Pwr.—$6—no par	81	72	84
Tex. Pwr. & Lt.—7%.....	*f* 102½	102	104
Toledo Edison—8%.....	110	109	114
Toledo Edison—7%.....	100	94	101½
Utah Pwr. & Lt.—7%.....	*f* 100½	100	101½
Utica Gas & Elec.—7%.....	101	100	104
Vermont Hydro-Elec.—7%....	87	87	96
Virginia Pwr.—7%.....	101	94	107
West Penn—7%.....	*f* 99½	94	99½
West. States Gas & Elec.—7%.	89	82	92
Wis.-Minn. Lt. & Pwr.—7%...	95	92	99
Yadkin River Pwr.—7%.....	*f* 102	102	103
Holding Companies			
Amer. & Foreign Pwr.—7%....	90¾	87	94
Amer. Gas & Elec.—6%—no par	90	85	91
Amer. Lt. & Trac.....	101	93	101½
Amer. Pwr. & Lt.—6%.....	91	84	91½
Amer. Pub. Serv.—7%.....	90	88	94
Amer. Pub. Utilities—5%.....	80	71	82
Amer. Pub. Utilities—7%.....	91	87	95
Amer. Water Wks. & Elec.—6%	*f* 110½	95½	110¼
Amer. Water Wks. & Elec.—7%	*f* 99½	99	103
Assoc. Gas & El.—7%—1% extra—50.....	*f* 52	....	....
Assoc. Gas & Elec.—$6—no par	84	....	....
Carolina Pwr. & Lt.—$7—no par.....	105½	100	107
Central Ark. Ry. & Lt.—7%...	97	91	98½
Central Ind. Pwr.—7%.....	90	88	95
Central States Elec.—7%.....	93	87	98
Cities Serv.—6%.....	82	80	83
Columbia Gas & Elec.—7%....	109½	104½	110¼
Commonwealth Pwr.—6%.....	80	80	85½
Continental Gas & Elec.—7% pfc. pf.....	94	85	97
Continental Gas & Elec.—7% pr. pf.....	92	89	95
Elec. Bond & Share—6%.....	*f* 104½	105	106½
Elec. Investors—7%.....	99	90	100
Galveston-Houston Elec.—6%	70	70	75
Gen. Gas & Elec.—6%.....	228	72	230
Gen. Gas & Elec.—7%.....	150	120	....
Gen. Gas & Elec.—$7—no par	160	90	175
Gen. Gas & Elec.—$8—no par	170	104½	180
Georgia Lt., Pwr. & Rys.—6%..	80	74	85
Jersey Central Pwr. & Lt.—7%	96	90	96
*a*Middle West Utilities—7%...	97	91½	98¾
Middle West Utilities—pr. lien 7%.....	101	98	108
Natl. Lt., Ht. & Pwr.—5%....	62	40	62
Natl. Pwr. & Lt.—$7—no par.	101½	95	99
No. Amer.—6%—50.....	*f* 49¾	46¾	50¾
No. Tex. Elec.—6%.....	55	60	75
Penn-Ohio Elec.—7%.....	94	83½	96
Phila. Co.—50.....	49	45½	49
Pub. Serv. Corp. of N. J.—7%	100⅝	99	102½
Pub. Serv. Corp. of N. J.—8%	*f* 115½	109	115½
Southeastern Pwr. & Lt.—7%..	98	90	100
Southern Cities Utilities—7%..	87	77	100
Southwestern Pwr. & Lt.—7%	101½	90	102
Standard Gas & Elec.—8%....	*f* 54	50½	54½
Standard Gas & Elec.—7%....	99	96	100
Standard Pwr. & Lt.—7%.....	112	95	114½
United Gas & Elec.—5%.....	91	80	94
*c*United Gas Improv.—50....	87	79½	96½
United Lt. & Pwr.—$4—no par	48	41	51
United Lt. & Pwr.—$6.50—no par.....	87	83	99
Western Pwr. Cor.—7%.....	94	84	95½
COMMON STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—50....	97	31	98
Appalachian Pwr.—no par.....	79	80	83
Arizona Pwr.....	29	15	33
Arkansas Lt. & Pwr.....	100	65	101
Brooklyn Edison.....	*f* 138½	120⅜	140⅜
Buffalo Gen. Elec.....	73	44	73½
Cleveland Elec. Illg.....	240	200	250
*a*Commonwealth Edison.....	136	130½	141½
*e*Consol. Gas, Elec. Lt. & Pwr.	43½	32	45
Dayton Pwr. & Lt.....	420	180	460
Detroit Edison.....	125⅜	110	125⅞
Eastern Tex. Elec.....	70	70	75½
*d*Edison Elec. Illum. of Boston	209½	200	213
Georgia Ry. & Pwr.....	95	62	99
*a*Ky. Hydro-Elec.....	92	85¾	92½
Long Is. Light.....	105	60	105
Miss. River Pwr.....	64	37	68
Montana Pwr.....	*f* 86	64	89½
New Orleans Pub. Serv.—no par	33	31	38½
Niagara Falls Pwr.—no par...	70	45½	75½
Niagara, Lock. & Ont. Pwr.—no par.....	65	60	73
North. Ohio Pwr.....	12	5	13½
North. States Pwr.....	123	103	125
North. Tex. Elec.....	40	40	70
Pacific Gas & Elec.....	*f* 114½	102½	118½
*e*Penn. Wtr. & Pwr.....	147	126½	152½
*c*Phila. Elec.—25.....	39	37¼	47⅝
Portland Elec. Pwr.....	40	40	53
Pwr. Corp. of N. Y.—no par...	87	15	89½
Pub. Serv. Co. of No. Ill.....	122	97	124
Puget Sound Pwr. & Lt.....	53	49	61
So. Calif. Edison.....	120	102	122
Tenn. Elec. Pwr.—no par.....	66	40	69
Toledo Edison.....	25	21	25
Utica Gas & Elec.....	200	100	200
Virginia Pwr.....	66	65	92
Virginia Ry. & Pwr.....	*f* 120½	64¾	123
West Penn.....	126	105	145
Holding Companies			
Amer. & Foreign Pwr.—no par	*f* 44¾	27½	47
Amer. Gas & Elec.—no par...	82	70	85
Amer. Lt. & Trac.....	170	139	173½
Amer. Pwr. & Lt.....	62	52	67
Amer. Pub. Serv.....	85	45	90
Amer. Public Utilities.....	100	70	103
Amer. Wtr. Wks. & Elec.....	*f* 68½	34¾	68½
Assoc. Gas & Elec., Class A...	*f* 40¾	....	....
Carolina Pwr. & Lt.—no par..	390	290	425
Central States Elec.....	99	70	102
Cities Service (new).....	38½	34	43
Columbia Gas & Elec.—no par.	*f* 68¾	45¾	69¾
Commonwealth Pwr. Corp—no par.....	172	106	173
Cons. Gas—no par.....	*f* 91½	74½	92⅜
Continental Gas & Elec.....	130	77	99
Elec. Bond & Share Sec.....	*f* 69½	69½	72¾
Elec. Investors.....	65	30	66
Elec. Pwr. & Lt.....	*f* 38¾	17⅜	40½
Federal Lt. & Trac.....	*f* 32	30	36
Galveston-Houston Elec.—no par.....	25	32	45
General Gas & Elec.....	225	72	230
Georgia Lt., Pwr. & Rys.....	61	25	68
Georgia Ry. & Pwr.....	95	62	99
Jersey Central Pwr. & Lt.....	45	15	50
Lehigh Pwr. Securities—no par	148	82	131
*a*Middle West Utilities—no par	94½	82½	102¾
*a*National Elec. Pwr.....	95½	95	96¾
Natl. Lt., Ht. & Pwr.....	11	11	....
Natl. Pwr. & Lt.—no par.....	340	185	357
No. Amer.—10.....	*f* 57	41½	59
Phila. Co.—50.....	*f* 60⅜	51½	61⅜
Pwr. Securities—no par.....	13	....	....
Pub. Serv. Corp. of N. J.—no par.....	*f* 72½	62⅜	74
Republic Ry. & Lt.....	64	49	65
Southeastern Pwr. & Lt.....	125	45	135
Southern Cities Utilities.....	53	30	55
Standard Gas & Elec.—no par.	*f* 56½	40¼	57⅜
United Gas & Elec. (Conn.)—no par.....	47	26	49
United Lt. & Pwr.—A—no par	113	42	117½
United Lt. & Pwr.—B—no par	110	49	100
Western Pwr. Corp.—no par..	66	34	68
BONDS			
Operating Companies			
Adir. Pwr.. & Lt... 6s	1950	104¾	102½ 105½
Ala. Pwr..... 5s	1946	99⅝	96 100
Appalachian Pwr... 5s	1941	98½	96 99¾
Brooklyn Edison... 5s	1949	102	99¼ 103
6s	1930	104¾	103⅛ 105½
Cleveland Elec. Illum. 5s	1939	102	100 102
Com'wealth Edison. 5s	1943	101½	99⅝ 102¾
5s	1953	99¾	98½ 101
*e*Consol. Gas Elec. Lt. & Pwr..... 4½s	1935	97¾	93¼ 97¾
6s	1949	107	104¼ 107¾
Consumers' Pwr.... 5s	1936	100	99 100¾
5s	1952	97	90½ 100
Detroit Edison..... 5s	1933	101½	99⅜ 102¾
Duquesne Lt..... 6s	1949	106½	104⅛ 107⅜
Great Western Pwr. 5s	1946	98½	95 99¾
Kansas City Pwr. & Lt..... 5s	1952	99⅜	95⅛ 101
Miss. River Pwr.... 5s	1951	99½	96½ 100½
Montana Pwr..... 5s	1942	99⅛	97⅛ 100⅜
New Eng. Pwr..... 5s	1951	102½	100¼ 103
N. Y. Edison..... 6½s	1941	114½	112 115½
Niagara Falls Pwr.. 6s	1950	106	103¾ 106½
No. States Pwr..... 5s	1941	97½	93 99½
No. States Pwr..... 6s	1941	104¾	103 107½
Ohio Pwr..... 7s	1951	106½	106½ 107½
Pacific Gas & Elec. 5s	1942	97⅜	93½ 99
Penn. Wtr. & Pwr.. 5s	1940	100½	99¼ 102
*c*Phil. Elec..... 5s	1966	103½	100¾ 103½
5½s	1947	106½	103½ 107
6s	1941	106½	106 108⅜
Portland Elec. Pwr. 6s	1947	99½	96½ 100
So. Cal. Edison.... 5s	1939	99½	99¼ 101
6s	1944	104½	102½ 105½
Tenn. Elec. Pwr.... 6s	1947	102½	99½ 104½
Tex. Pwr. & Lt.... 5s	1937	98⅜	97 99⅝
Toledo Edison..... 7s	1941	108½	108⅜ 110
Utah Pwr. & Lt.... 5s	1944	95	91 98½
Holding Companies			
Ala. Trac. Lt. & Pwr. 5s	1962	92½	86 95
Amer. Gas & Elec... 6s	2014	98	96½ 98½
Amer. Pwr. & Lt... 6s	2016	97	94 98
Am. Wtr. Wks. & Elec..... 5s	1934	95⅝	92½ 98
Assoc. Gas & Elec... 6½s	1954	*f* 102½	....
Central Ind. Pwr... 6s	1947	98⅜	95½ 99¼
Commonwealth Pwr. 6s	1947	102	97⅛ 103⅜
Consol. Cities Lt., Pwr. & Tr..... 5s	1962	80½	75½ 82½
Ill. Pwr. & Lt..... 6s	1953	101½	100⅛ 102½
United Lt. & Rys... 5s	1932	96½	93¼ 97⅛
6s	1952	99½	95¾ 100⅜
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Mfg.....	*f* 106½	103¾	108
*b*Wagner Elec.....	79	79	91
West. Elec. Instrument—A...	*f* 25½	19⅜	26⅜
Western Elec.—7%.....	*f* 115½	115¾	117½
Worthington Pump & Mach.—A	75	68	89½
Worthington Pump & Mach.—B	64½	65	76½
COMMON STOCKS			
Allis-Chalmers Mfg.....	*f* 85	71½	86½
Amer. Bosch Magneto—no par	*f* 33⅞	26½	54½
Elec. Storage Battery—no par	*f* 63⅞	60⅜	70½
General Elec.....	*f* 294¾	227½	320
General Elec.—10.....	*f* 11¼	11	11⅞
*a*Hurley Machine—no par....	48¼	41⅜	56
Timken Roller Bearing.....	*f* 44½	37½	46½
*b*Wagner Elec.....	32½	26½	50
Westghse. Elec. & Mfg.—50..	*f* 73½	66½	84
West. Elec. Instrument.....	*f* 16¾	9¼	17½
Worthington Pump & Mfg.....	*f* 41½	36¾	79¼
BONDS			
General Elec..... 3½s	1942	85	83 85
5s	1952	107½	101½ 107½
Robbins & Myers.. 7	1952	65	63½ 73½
Wagner Elec. Mfg.. 7s	....	100	100 102
Western Elec..... 5s	1944	99⅜	98 101
Westghse. Elec. & Mfg..... 7s	1931	107	106½ 108½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore. *f*Bid price, low and high, Tuesday, July 21.